# Russian-German Cooperation
# SYSTEM LAPTEV-SEA 2000:
# The Expedition LENA 2001

Edited by Eva-Maria Pfeiffer
and Mikhail N. Grigoriev

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**Russian-German Cooperation SYSTEM LAPTEV-SEA 2000:**

# The Expedition LENA 2001

*by the participants of the expedition*

*edited by Eva-Maria Pfeiffer and Mikhail N. Grigoriev*

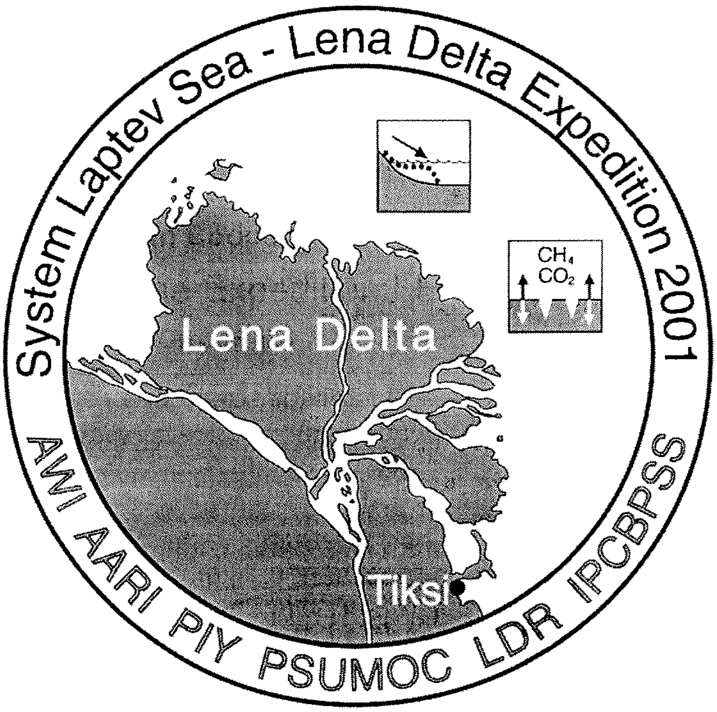

**Figure 1: Participants of the Expedition LENA 2001 (without team 3):**
front (left to right): C. Wille, G. Stoof, D. Wagner, N. Abramson, S. Kobabe - middle: H.-W. Hubberten, F. Are, E.-M. Pfeiffer, W. Schneider - behind: M. Grigoriev, A. Kurchatova, D. Bolshianov, L. Kutzbach, S. Razumov, M. Tretiakov

# Contents

## Acknowledgments

The Russian-German expedition LENA 2001 was a successful and memorable field working time in the artic Siberia. We have had the chance to be the guests in the fascinating landscape of the Lena Delta where we could continue our research on permafrost related processes. LENA 2001 brought forward new ideas and we are still busy to conclude all investigations for the common synthesis of all obtained data.

The expedition LENA 2001 would not have been possible without the help and support of all our colleagues and friends in Moscow, St. Petersburg, Yakutia and Tiksi. Our special thank goes to D. Melnichenko, V.N. Gorokhov and all people from Tiksi – they gave us the feeling to leave not only as interested scientists but as friends.

We thank several Russian, Yakutian and German institutions and authorities for their interest and support. In particular, we reciprocate the Tiksi Hydrobase, the Lena Delta Reserve and the crew of the vessel "Neptun".

We thank the Federal Ministry of Education and Research of Germany, the Russian Ministry for Science and Technical Policy of the Russian Federation and the Directorate of the Alfred Wegener Institute of Polar and Marine Research in Bremerhaven, which enabled the LENA 2001.


# 1 Russian-German Co-operation

*(E.- M. Pfeiffer and M. N. Grigoriev)*

The Laptev Sea and its hinterland – especially the Lena Delta - is one key region for the understanding of the dynamic of the Arctic climate system.

On the basis of previous, multi-disciplinary investigations of Russian-German projects (The Laptev Sea System, Taymyr, 1994-1997) many important results for the climatic reconstructions of the late Quaternary and the understanding of the recent permafrost system in the Siberian Arctic were obtained and are presented in a collection of papers published by Kassens et al. (1999). The investigations indicate the close interaction of the coupled land-ocean system of the Laptev Sea with the East Siberian hinterland. The present knowledge shows that environmental changes in this area do not only affect the Arctic Ocean but also contribute to variations in the global climate system.

The investigations of the Russian-German Cooperation SYSTEM LAPTEV SEA 2000 (1998-2001) concentrated on the following topics:

- Seasonal variability of modern trace gas fluxes in permafrost areas
- Environmental reactions of the terrestrial-marine system of the Siberian Arctic during the last 100 years
- Land-ocean interactions and the influence on the sediment budget of the Laptev Sea

- Terrestrial system: short- and medium-term climatic trends in the Siberian Arctic
- Marine system: long-term climatic trends in the Siberian Arctic

Within the framework of the project SYSTEM LAPTEV SEA 2000 three terrestrial expeditions to the Lena Delta and the Laptev Sea coastal region were performed during spring/summer periods 1998 to 2000 (Rachold and Grigoriev, 1999, 2000 and 2001). Based on the experiences and results of these expeditions, the fourth expedition LENA 2001 was carried out from July 16th July to August 28th, 2001. The multi-disciplinary teams of 11 Russian and 8 German scientists worked in the Lena Delta and on the Bykovsky Peninsula (Figure 1-1 and Figure 2-1).

The scientific working program of the expedition LENA 2001 was focused on the following terrestrial research objectives:

- Seasonal variability of modern trace fluxes in permafrost areas (*Chapter 3: Modern Processes in Permafrost Affected Soils*)
- Ecosystem studies and biological monitoring in the Lena Delta and Siberian Arctic (*Chapter 4: Biological Research in the Lena Delta)*
- Shore erosion, accumulation processes and run off studies in the Lena Delta *(Chapter 5: Shore Erosion and Sediment Fluxes from Eroded Islands and Chapter 6: Water and Sediment Run Off in large Bifurcation Points of the Lena River Delta)*
- Land-ocean interactions and the influence on the sediment budget of the Laptev Sea (*Chapter 7: Coastal Processes and Methane Dynamics in the Northwestern Part of the Lena Delta*)
- Terrestrial system: short- and medium-term climatic trends in the Siberian Arctic (*Chapter 8: Paleoecological and Permafrost Studies of Ice Complex in the Laptev Sea - Bykovsky Peninsula*)

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Kassens, H., Bauch, H., Dmitrenko, I., Eicken, H., Hubberten, H.-W., Melles, M., Thiede, J. and Timokhov, L. (1999), Land-Ocean systems in the Siberian Arctic: dynamics and history. Springer, Berlin, 711pp.

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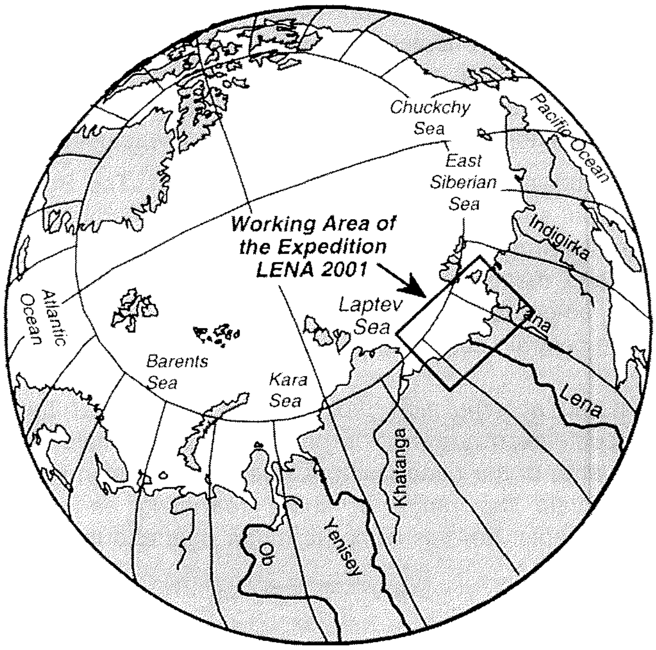


**Figure 1-1**: Working area of the Expedition Lena 2001

# 2 Expedition Itinerary

*(E.-M. Pfeiffer and M. N. Grigoriev)*

## 2.1 Working areas

Concerning the scientific working program, the expedition LENA 2001 worked in three teams and in three different working areas, which are shown in Figure 2-1:

### Team 1 (Samoylov Island)

The group was based on the Island Samoylov in the central part of the Lena Delta (72°22'N, 126°28'E). The interdisciplinary team worked in two sub-groups and their research was concentrated on modern processes in the Lena Delta:

### Team 1a:

*Modern Processes in Permafrost Affected Soils (→ Chapter 3):* Within the 2001 field campaign, the measurements of trace gas emission ($CH_4$ and $CO_2$), which are needed to establish the balance of greenhouse gases in the Lena Delta, were continued for this summer season. The microbial process studies on in situ $CH_4$ fluxes were carried out. The measurements of the water and energy balance in the permafrost-affected soils were continued. These investigations were complemented by the drilling of deeper permafrost sediments and ice wedges on Samoylov and on comparable sites on the Islands Sardhah and Kurunghnah. For the drilling work the vessel "Neptun" was used as basis.

*Biological Research in the Lena Delta (→ Chapter 4):* The State Lena Delta Reserve carried out several investigations on important ecosystem parts of the Lena Delta. In the frame of the Expedition Lena 2001 the zooplankton of different lakes and the birds' distribution in the Lena Delta was monitored. Additionally, in co-operation with the university of Moscow the lemming distribution in the central Lena Delta could be investigated.

*Shore erosion and accumulation processes in the central Lena Delta (→ Chapter 5)*: Accumulation and erosion processes are of major importance for the sediment budget of the Lena Delta. Active shore erosion was investigated in order to estimate the range of shore retreating and the amount of accumulated sediments. For this work the motor boat and the vessel "Neptun" were used.

**Team 1b:**

Team 1b studied the water and sediment runoff in second-order bifurcation points in the rivers and channels of the delta. One of the largest bifurcation points in the delta, Sardakh-Trofimovsky was investigated to understand the river bed deformations and the runoff redistribution during the last decades. Team 1b worked most of the time with motor boots and lived in different field camps. For the investigations on Sardakh and its surroundings the vessel "Neptun" was used as research basis *(→ Chapter 6: Investigation of Run off in the Sardakh-Trofimovsky Bifurcation Point of Lena River Delta, East Siberia, Russia, and related River Bed Deformations)*.

**Team 2 (Arga Island)**:

During the expedition LENA 2001 team 2 worked in the region of Babaryna Island/Sanga-Dzhie which is located in the northwestern part of the Lena Delta (73°30-35'N, 123°10-30'E). The team lived in a field camp and used a motor boot for daily excursions and field measurements. The major scientific objectives were to investigate the very specific coastal erosion processes and shoreline dynamics in this area and to acquire first insights into the $CH_4$ dynamics of the wide landscape of Arga Island (→ Chapter 7: Coastal processes and methane dynamics in the northwestern part of the Lena Delta).

**Team 3 (Bykovsky Pensinsula)**

Based on the previous research of the Late Pleistocene Ice Complex in the Lena Delta under the Russian-German project "Laptev Sea System 2000" the paleoecological and permafrost studies could be continued in 2001. The

Russian team worked on Bykovsky Peninsula (71°41'N, 129°25'E) and their geocryological investigation were focused on the understanding of the cyclic character of Ice Complex deposits and their development. The studies on fossil insects and mammal bones as important archives could be extended. Additional ice wedges were sampled for the reconstruction of the past winter temperatures *(→ Chapter 8: Paleoecological and permafrost studies of Ice Complex in the Laptev Sea area)*.

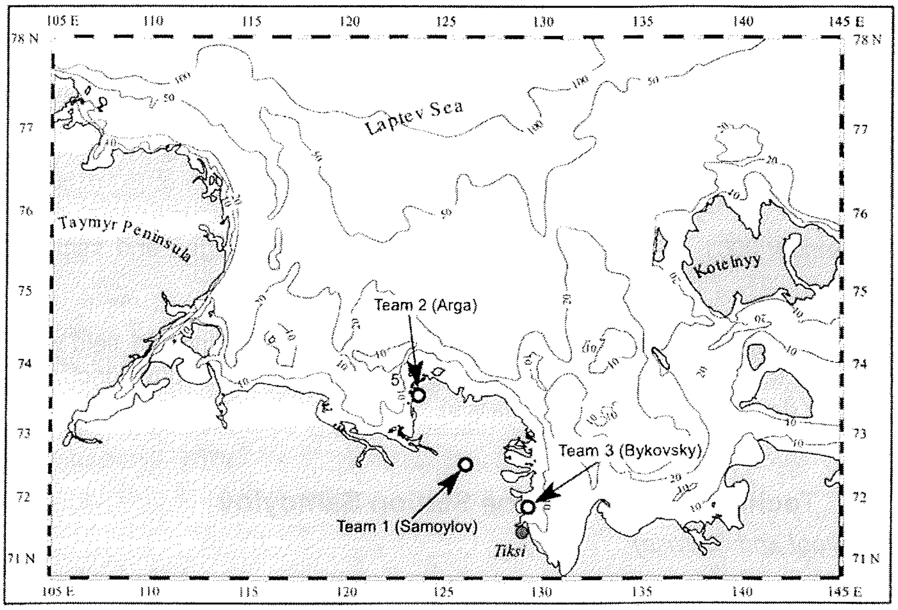


**Figure 2-1:** The working areas of the expedition LENA 2001.

## 2.2 General logistics and transport

The general logistics of the LENA 2001 Expedition were jointly organized by the Permafrost Institute (Yakutsk), the Arctic and Antarctic Research Institute (St. Petersburg) and the Research Unit Potsdam of the Alfred Wegener Institute. Logistic operations in Moscow were organized by the Company "Nadeshda" (food, cooling and transportation of frozen samples) and in Tiksi by the Hydrobase (renting of buses, trucks, helicopters etc.). The Lena Delta Reservat (LDR) in Tiksi provided the small base on the Island of Samoylov for cooking, working, GC-laboratory and lodging for 2-3 people. Most of the team members had to sleep in tents. Additional working and lodging space could be used in a removal shack (balock). The total cargo accounted 3,5 tons thereof 2 tons for catering.

**imetable of the expedition Lena 2001:**

| | |
|---|---|
| June 22, 2001 | Transportation of all expedition charges Potsdam – St. Petersburg-Moscow-Tiksi |
| July 14, 2001 | Flight Berlin-Moscow for all teams |
| July 15-16, 2001 | Flight Moscow-Tiksi |
| July 17, 2001 | Preparation of fieldwork in Tiksi |
| July 18, 2001 | Helicopter transfer from Tiksi to the field all teams |
| July 18 - August 26 | Fieldwork of team 1 and 3 |
| July 18 – August 3 | Fieldwork of team 2 |
| August 3, 2001 | Helicopter transfer of team 2 back to Tiksi |
| August 6-8, 2001 | Flight back Tiksi-Yakutks-Moscow for team 2 |
| August 27, 2001 | Transfer of team 1 and 3 back to Tiksi |
| August 28-29, 2001 | Preparation for departure in Tiksi |
| August 30 | Flight Tiksi-Moscow for team 1 and 3 |
| August 31, 2001 | Flight Moscow-Berlin for team 1 |
| September 2001 | Transport of all expedition charges and samples to Potsdam |

The whole duration of the expedition have been 49 days (incl. 41 field working days) for team 1 (Samoylov) and team 3 (Bykovosky) and 22 days (incl. 17 field working days) for team 2 (Arga Islands).

## 2.3 Technical Report of the Station Samoylov

*(G. Stoof and C. Wille)*

### 2.3.1 Status of the station

In 2001 the Samoylov station presented itself in a newly renovated condition. The rooms were painted and workbenches had been built along the walls. By this, the working conditions in the station building had been considerably improved compared to previous years.

A two-storied shack (Balock) which had been moved to Samoylov during the winter improved the situation further. The upper floor accommodates 6 beds, the lower floor was used for work and for sample storage and -drying.

With the space it presently offers, the station was used to full capacity during this year's expedition. For bigger expedition groups, as well as for expeditions in winter, the expansion of the station should be considered. During winter months accommodation in tents is not advisable; moreover, the existing sanitary facilities cannot be used - or at least only to a very restricted degree. For this reason, an extension of the station building including sanitary facilities becomes necessary. Also, the water supply would have to be reorganised accordingly. The following illustration shows the existing station building together with a suggestion for an extension.

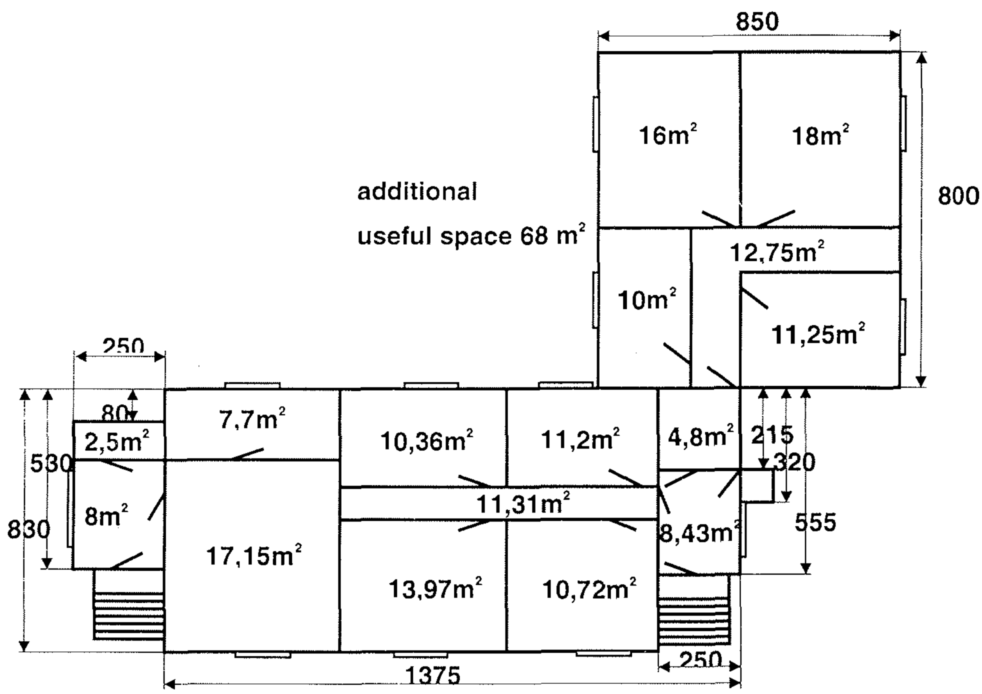


**Fig. 2-2:** Samoylov station building with extension proposal (values in cm)

The extension should be orientated at an angle of 90° with respect to the axis of the existing building. Like the existing station-building, it should be a plastered framehouse. However, the isolation of the outside-walls should be improved.

### 2.3.2 Power supply

The smooth running of the scientific work on Samoylov was highly dependent on a stable power supply to the various equipment, especially the gas chromatograph. Since the existing electricity installation was not adequate for the power requirements and did not correspond to the current security standards, most of it had to be rebuild. The circuits were equipped with fuses and protective switches, new cables were laid, and new sockets and lamps installed in the laboratories.

For the power supply a new 6 KVA diesel generator was used. The generator proved to be reliable and user friendly. A damage in the electronic control unit which caused a power failure of several hours could be repaired on the spot. The absence of an electric starter proved to be disadvantageous since not every member of the expedition was able to start the generator.

The power rating of the generator was sufficient for the supply of the equipment used and still holds reserves for the future. However, peak loads, for example during the use of the electric welding apparatus, have to be co-ordinated accordingly.

Problems were caused by the high content of water in the diesel fuel. However, these problems could be avoided by careful refuelling procedures. A special 130 litres auxiliary tank which had been bought in Tiksi could not be used because of a leaky hose adapter. Because of this, the generator had to be refuelled at intervals of approximately 4 hours. During approximately 300 hours of operation, the generator used 265 litres of fuel which corresponds to an average consumption of 0,9 litres per hour. Necessary maintenance work was restricted to the changing of the engine oil; all in all 5 litres of oil were used.

In order to have a power supply independent from the diesel-generator during periods of low power consumption, a wind generator AIR 403 (12V, 400W), a set of lead batteries (12V, 390Ah), and an AC converter (12V/220V, 400W) were installed. This system allows the operation of the laboratory lights, as well as laptops, satellite-telephone, chargers and other small devices. Additionally, a 12V - power supply was installed in the station leader apartment and the Letnik (cave in the frozen ground for storing food). After the experiences collected with the wind generator system during the this year's expedition, the extension of the battery capacity is planned for the next year.

### 2.3.3 Soil and climate stations

The measuring stations for soil and climate data have worked since 1998 and were still in a good condition in 2001. The climate station had collected data during the period 17.08.-22.10.00 and from 18.03.01 onwards, the soil station from the period 11.08.-13.11.00 and from 29.01.01 onwards. The interruption in the data results from the insufficient power supply of the stations by the solar panel during winter months. To avoid this problem in future, a wind generator was installed to support the solar panel, and the battery capacity was increased by an additional lead battery. These measures should enable a stable 12V power supply the whole year through.

All components of the climate station were checked. The cables of both moisture and temperature sensors were damaged by animal bites; as a result one of the sensors (at 0,5m height) had to be exchanged. The data logger was exchanged because of a call back from the manufacturer. A second net radiation sensor (Q7) was installed for comparison measurements.

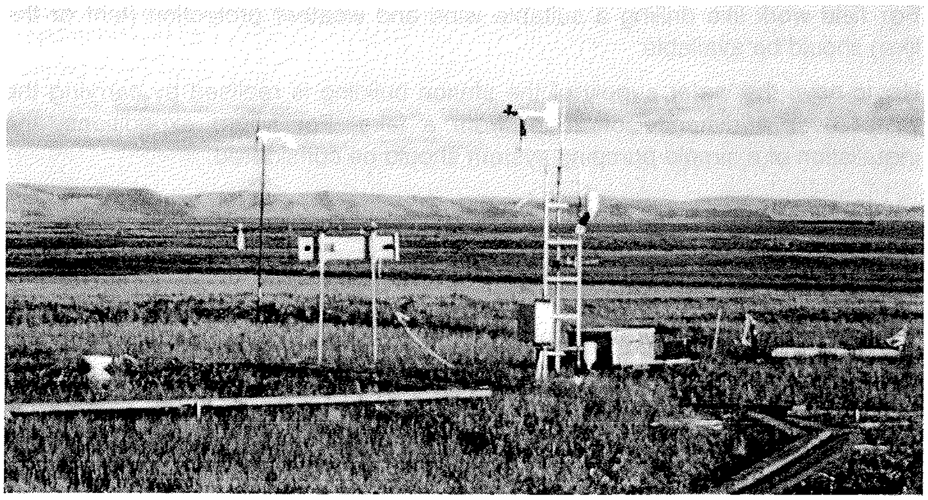

**Fig. 2-3:** Soil and climate measurement stations with solar panel and wind generator

The rain gauge was cleaned; its calibration was checked. The guy wires and anchors of the measuring tower were rebuilt. A new measuring program was installed and tested.

All systems of the soil station were thoroughly checked. A new base for the enclosure was built, the running of the outside cables was reorganised. The TDR - and soil temperature systems were rearranged for better accessibility. A Coax-Multiplexer had to be exchanged because of corroded contacts. All electric connections were checked and renewed if necessary. The existing storage module (4 MB) was replaced by a new module with 16MB storage capacity. A new measuring program was installed and tested.

The whole measurement equipment, which was installed in the investigation site (reference plot 2), is shown in Figure 3-3.

### 2.3.4 Equipment

Altogether the Lena 2001 expedition was well equipped. Several tools which have been taken on an expedition for the first time, like welding apparatus and angle grinder, extended the range of possible construction and repair works. Tools like the chainsaw and the hammer drill which had been used in previous years proved to be very useful again.

The tents used this year did not prove suitable for this expedition. They were too small, not sufficiently waterproof, and did not have any mosquito nets. More suitable tents should be made available.

For field work like drilling a suitable wind and weather protection (tent or the like) should be available.

Up to now, the water supply of the station building is realised by carrying the water over a distance of 250m from a lake. For future expeditions, the installation of a simple pumping system should be considered.

## 2.4 Timetables of individual working groups

### 2.4.1 Team 1 (Samoylov Island)

| | |
|---|---|
| July 16-17 | Tiksi: organizing and preparation of equipment, logistic coordination with local partners |
| July 18 | transfer to Samoylov Island with helicopter and installation of the camp and arrangement of the base, installation of a 6KVA generator, |
| July 19 | installation of the GC-laboratory and working places, first inspection of the climate and soil stations (measuring plot), begin of lake monitoring |
| July 21 | GC-calibration and instruction, beginning of the daily emission measurements, choosing a reference site for soil microbial studies and permafrost drilling, beginning of the daily lemming collection |
| July 22 | analysis of gas samples, checking of the automatic climate station, continuation of lake investigations |
| July 23 | work scheduling for the first week, preparation of an ice-wedge-cross-section, installation of the pin wheel and wind generator (12V, 400W) at the station |
| July 24 | continuation of profile preparation, description and sampling of the ice wedge profile (soil samples), rebuilding of the electricity installation in the whole station building |
| July 25 | starting of the first 6-days boat trip of team 1b to the Sardakh-Trofimovsky bifurcation, continuation of soil and gas sampling |
| July 26 | continuation of profile work and gas sampling, first drilling of ice samples of the ice wedge polygon, studies on in situ $CH_4$ oxidation |
| July 27 | data collection and check of the automatic soil station, installation and test of a new measuring program, emission measurements and gas sampling |
| July 28 | description and sampling of an ice wedge exposure at the southern coast site, degasification of ice samples and preparation for FISH analysis |
| July 29 | continuation of emission measurements, gas sampling for isotope analysis, first collection of lemmings. |
| July 30 | continuation of sampling and studies on the $CH_4$-oxidation, first evaluation of the field data, lake sampling |

| | |
|---|---|
| July 31 | beginning with the permafrost drilling of the polygon site (core 1/2001), up to 2,70 m depth, problems with penetrating surface water; return of team 1b |
| August 1 | continuation of permafrost drilling, new bore hole (core 2/2001) up to 5,75 m depth |
| August 2 | continuation and finishing the permafrost drilling (7,50 m depth) at the polygon site (core 2/2001), in situ studies on methane oxidation |
| August 3 | first analysis of field data, arrival team 2, transfer H.-W. Hubberten, F. Are, S. Rasumov, N. Abramson und D. Wagner back to Tiksi |
| August 4 | Start with the permafrost drilling at the southern coast of Samoylov (core 3/2002)-, drilling depth 4,75m. Team 1b leave for the second boat trip to Sardakh region |
| August 5 | continuation of permafrost drilling up to a depth of 7m, problem with the motor of drilling machine. Continuation of in situ $CH_4$ oxidation experiment |
| August 6 | Repair of the drilling machine, determination of biomass production (Carex concolor) in centre of the reference polygon (plot 3) |
| August 7 | Finishing the permafrost drilling at bore hole 3 (core 3/2001: drilling depth 8,28m) |
| August 8 | Preparation of the litter bags (minicontainer) for the determination of C-decomposition in the polygon centre at plot 3, soil monitoring in the western part of Samoylov |
| August 9 | continuation of soil monitoring and additional sampling for C- und N-Pools; arriving of vessel "Neptun" and return of team 1b |
| August 10 | soil description and sampling of additional $CH_4$ emission sites |
| August 11 | installation of the wind generator at the soil station, continuation of checking the soil map |
| August-12 | whole-time excursion with vessel "Neptun" to settlement Titari in the Lena River, sampling of Larix wood |
| August 13-16 | with "Neptun" to Sardakh Island and beginning with the drilling of permafrost sediments at the high floodplain (core 4/2001: 4,60m depth) and ice wedges, soil description and sampling of the active layer of a low centre polygon |
| August 17 | Trip with "Neptun" to Kurungnakh Island for drilling in the ice rich permafrost sediments. A first borehole (core 5/2001) had to be given up after 3,10 m depth because water had penetrated into the well |
| August 18-20 | Daily trip with "Neptun" to Kurungnakh, installation a new drilling place (core 6/2001) and continuation of the drilling of ice rich permafrost sediments up to 5,20m depth; additional soil description and sampling; ice sampling of an ice wedge exposure next to core 6 |

| | |
|---|---|
| August 21 | Continuation of soil and emission investigation on Samoylov, "Neptun" leave with team 1b for recent sedimentation studies in Sardakh region |
| August 22 | Additional soil sampling for determination of the C- und N-Pools |
| August 23 | Sediment and water sampling of a polygon lake for gas analysis and FISH studies, return of "Neptun", last soil sampling |
| August 24 | "Neptun" is leaving to Tiksi with A. Kurchatova and with the heavy expedition equipment, beginning with packing |
| August 25 | removing of field instruments, busy with packing |
| August 26 | organisation of the return transport of all expedition equipment and samples |
| August 27 | transfer to Tiksi with helicopter |
| August 28-29 | preparing and organisations of the charge- transportation to Moscow |

### 2.4.2 Team 2 (Arga Islands)

| | |
|---|---|
| July 18 | transfer Tiksi – Babaryna Island by helicopter |
| July 19 | installation of the camp. First excursion to the Island |
| July 20 | first excursion to the Sanga-Dzhie area with the Ochchugun-Nerpalakh Lake, the main area of studies concerning $CH_4$ dynamics. Excursion to the barrier |
| July 21 | bathymetric study of the Sanga Lake lagoon. Temperature profiles and water sampling. Work at the Ochchugun-Nerpalakh Lake |
| July 22 - | Continuation of the Methane-related investigations of soils and waters in the Sanga-Dzhie region |
| July 22 - 23 | geodetic measurements at the west coast of Babaryna Island. Measurements on the barrier west of Babaryna island |
| July 24 | geodetic measurements at Sanga-Dzhie Cape |
| July 25 | geodetic measurements at Cape Babaryna-Tumsa. Sampling of a peat profile at that location |
| July 26 | bathymetric measurements of shore face profiles west of the barrier (profile "Babaryna"). Water and bottom sediment sampling |
| July 27 | bathymetric measurements of shore face profiles "Sargalach", "Sanga". Water and sediment sampling |
| July 28 | bathymetric measurement of depth profiles at Sanga lake lagoon. Temperature measurements. Sampling of water and surface sediment cores. Measurement of driftwood heights |
| July 29 | bathymetric measurements of shore face profile "Kanal". Sediment and water sampling. Geodetic measurements of the 10 km long barrier south of Babaryna Island. Bathymetric measurement of depth profiles at Sanga Dzie lagoon. Water samples |

| | |
|---|---|
| July 30 | geomorphologic studies on Babaryna Island |
| July 31 | geodetic measurements at Sargylakh Island |
| August 1 | geodetic measurements at both sides of the Channel of Sanga-Dzhie Lagoon |
| August 2 | sampling of a peat profile at Cape Babaryna-Tumsa for microbiological studies. Transport of all equipment (boat , motor, etc.) to the camp |
| August 3 | dismantling of the camp. Transfer via Samoylov Island to Tiksi by helicopter in the evening |

### 2.4.3 Team 3 (Bykovsky Pensinsula)

| | |
|---|---|
| July 16-18 | in Tiksi: contacts with the Lena Delta Reserve personal, who was supposed to curate the Bykovsky team, planning of transportation to the site, preparation of equipment, purchasing food supply for the team |
| July 19 | transportation from Tiksi to the Mamontovy Khayata (MKH) former camp site on Bykovsky Peninsula by cross-country vehicle |
| July 20 | camp construction; first reconnaissance to the main outcrop |
| July 21 | beginning of work at the MKh exposure: selection of the main working area, geodesic survey of the site to correlate with the earlier landmarks (1998-99), description of the section, sampling of baydzherakh (bdzkh.) "O" for insect and other macrofossils (MKh-01-1, MKh-01-2, MKh-01-3), preparing the pond for mass screening on the thermo-terrace surface |
| July 22 | screening of insect samples, collection of large mammal bones within the outcrop and on the shore, beginning of permafrost studies |
| July 23 | description of the upper (Holocene) part of the section in bdzkh. "P", macrofossil sampling of bdzkh. "S" (MKh-01-04, MKh-01-09) |
| July 24 | description of bdzkh. "O", additional sampling of MKh-01-04a, screening of insect samples |
| July 25 | macrofossil sampling of MKh-01-09a from bdzkh. "S", collection of recent insects, permafrost study of bdzkh. "O" |
| July 26 | macrofossil sampling of bdzkh. "S" (MKh-01-08, additional MKh-01-09a), finding of horse bone in permafrost, screening of insect samples |
| July 27 | preparing a new pond for screening (on the yedoma surface), additional macrofossil sampling of MKh-01-08 |
| July 28-29 | macrofossil sampling of bdzkh. "S" (MKh-01-05, MKh-01-07, MKh-01-06) |
| July 28-31 | geocryological description of bdzkh. "S", screening of insect samples |
| July 29 | additional measurements (landmark survey) in the bdzkh. "S" area and collecting general (sediment) samples from this bdzkh. |
| July 30 | early morning session of photographic documentation of the section, screening of insect samples |

| | |
|---|---|
| July 31 | sampling of the first ice wedge transect for ice/water isotope composition; macrofossil sampling of bdzkh. "S" (MKh-01-10); excursion to Cape Mamont and collection of large mammal bones |
| August 1-4 | geocryological description of bdzkh. "I" |
| August 1 | macrofossil sampling of bdzkh. "S" (MKh-01-11) |
| August 2 | laboratory work with insect and ice/water samples |
| August 3 | additional measurements (landmark survey) in the bdzkh. "S" area with photo documentation; additional macrofossil sampling of bdzkh. "S" (MKh-01-8a, MKh-01-9b); finding and collection of bones in permafrost (two locations, horse and hare bones) |
| August 4-5. | macrofossil sampling of the lower part of bdzkh. "I" (MKh-01-12, MKh-01-13) |
| August 5 | sampling of the second ice wedge transect for ice/water isotope composition |
| August 6 | travel to Tiksi for additional food purchase (by cross-country vehicle |
| August 7-8 | laboratory work with ice and insect samples and bone collection |
| August 9 | geocryological description of bdzkhs. "I" "KS"; and laboratory work, visit of "Dunay" (M. Grigoriev and V. Schneider) |
| August 10 | macrofossil sampling of bdzkh. "I" (MKh-01-14) |
| August 11-12 | screening of insect samples, preparing a new place for screening; laboratory work on ice and insect samples; preparation of original field notes of the permafrost group by O. Lisitsyna |
| August 13 | two team members (I. Parmuzin and O. Lisitsyna) had to quit the field work for medical reasons and left the camp to Tiksi. |
| August 14 | laboratory work on insect and bone samples |
| August 15-17 | macrofossil sampling of the upper part of bdzkh. "I" (MKh-01-15, 15a) and of the "twig horizon" of bdzkh. "W" MKh-01-16, MKh-01-17); screening of insect samples |
| August 16 | excursion to the SE part of the MKh cliff |
| August 18-19 | screening of insect samples |
| August 19 | additional measurements (landmark survey) in the whole studied part of the MKh cliff, general description of the section |
| August 20-21 | laboratory work on various samples |
| August 22 | macrofossil sampling of bdzkh. "Z" (MKh-01-18) and of the lowermost part of bdzkh. "I" (MKh-01-19, MKh-01-20) |
| August 23 | collecting general (sediment) samples from bdzkh "O"; screening of insect samples |

| | |
|---|---|
| August 24 | the second early morning session of photographic documentation of the section; collecting general (sediment) samples from bdzkh "P"; macrofossil sampling of bdzkhs. "P" (MKh-01-21) and "O" (MKh-01-22) |
| August 25 | macrofossil sampling of bdzkh. "P" (MKh-01-21a and MKh-01-23); preparation of sediment samples (for pollen analysis, etc). |
| August 26 | sampling of three ice wedge transects for ice/water isotope composition of the Holocene and recent ice wedges; screening of insect samples |
| August 27 | laboratory work with ice and insect samples |
| August 28 | research of the fossil moose carcass in the SE part of the MKh area (with A.Gukov and the Lena Delta Reserve technicians), collecting of most of the carcass and of accompanying wood fossils; camp deconstruction and packing; transfer from Bykovsky Peninsula to Tiksi by cross-country vehicle. |

## 2.5 List of participants

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# 3 Modern processes in permafrost affected soils

*(E.-M. Pfeiffer, D. Wagner, S. Kobabe, L. Kutzbach, A. Kurchatova, G. Stoof, C. Wille)*

## 3.1 Objectives

Permafrost-affected soils, which cover nearly one fourth of the terrestrial surfaces in the northern hemisphere (Zhang et al. 1999), play a major role in the global carbon cycle. About 14 % of the global organic carbon is stored in permafrost soils and sediments (Post et al. 1982). The importance of these regions are discussed regarding an expected climate warming. Especially, the carbon fixation in permafrost soils and the release of climate relevant trace gases like $CH_4$ and $CO_2$ due to the carbon decomposition are important for the global carbon budget.

The interdisciplinary soil and microbiological studies are focused on the seasonal variability of the modern carbon fluxes ($CH_4$, $CO_2$), the quantification of microbial processes as well as the thermal and hydrological dynamics of permafrost affected soils of the Lena Delta.

Anticipating global warming by an enhanced greenhouse effect, high-latitude ecosystems are expected to warm more rapidly and to a greater extent than the rest of the biosphere (Schlesinger et al. 1987). To assess the effects of climatic change on arctic ecosystems with regard to the carbon cycle and possible feedbacks to the atmospheric system, it is important to improve the knowledge about permafrost-affected soils. The main questions are: How much organic matter is stored in tundra soils and in which horizons? How does the decomposition of organic matter work in the arctic temperature regime and how is it controlled by ecological factors? How is the release of $CO_2$ and $CH_4$ from permafrost landscapes related to soil properties? How are the $CH_4$ fluxes forced by the microbial communities? Will the permafrost regions turn from global carbon sinks to carbon sources due to global warming?

## 3.2 Methods and Field Experiments

Soil Research:

In August 2001, 25 reference soil profiles were investigated in the central Lena Delta (see Figure 3-1). 19 profiles were located on Samoylov Island (72°23' N, 126°29' E), 9 profiles on the first terrace and 10 profiles on the modern floodplain. 2 profiles were located on Sardakh Island (first terrace, 72°34' N, 127°1' E) and 4 profiles on Kurungnakh Island (third terrace, 72°21' N, 126°13' E). The distribution of the terraces in the Lena Delta is shown in figure 3-2. Soils were described and classified according to the 8th edition of the *Soil Taxonomy* (Soil Survey Staff 1998) and the 4th edition of the German field book for describing soils *Bodenkundliche Kartieranleitung* (AG Boden 1994).

Additionally, soils were classified according to the *World Reference Base for Soil Resources* (FAO 1998) and the Russian system of Jelovskaya (1987). Thus, the four classification systems could be compared and correlated. Air-dried soil samples as well as cooled moist samples were taken from reference soil profiles to investigate soil chemistry and soil microbiology, respectively. To derive mean values of organic matter content in a spatial context, additional soil samples were taken by a ground auger at evenly distributed points in the area covered by the particular soil type. Soil cores were subdivided into organic, aerobic mineral, and anaerobic mineral material to determine the quantity and type of organic matter in the different soil horizons separately. A detailed sample list is provided in Table A3-1

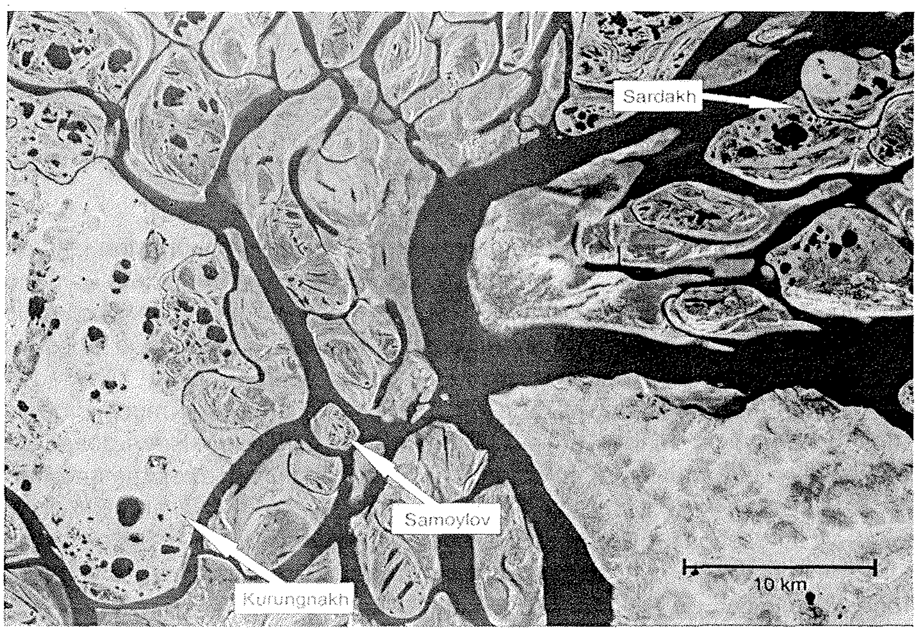


**Figure 3-1**: Location of working sites in the central Lena (satellite image provided by Statens Kartverk, UNEP/GRID-Arendal and Landsat 2000)

Additionally the above ground biomass was determined by harvesting the plant material (Carex concolor) of a typical low centre polygon site (next reference plot 2). The fresh and dry weight had been determined in the field laboratory. Samples were taken and dried at 60°C for further plant analysis.

Part of the harvested plants was used for the determination of decomposition rates in the soil of the polygon centre. Special litter bags (minicontainer according to Eisenbeis et al. 1995) with the meshsize of 0,73 mm and 2 mm were installed. The fresh plant material in 11 minicontainer was buried in 4 depths (2, 4, 10 and 21 cm) in the reference plot 2. The excavation is planned after 1 and 2 years. All installed research tools of the soil station (reference plot 2) are shown in Figure 3-3.

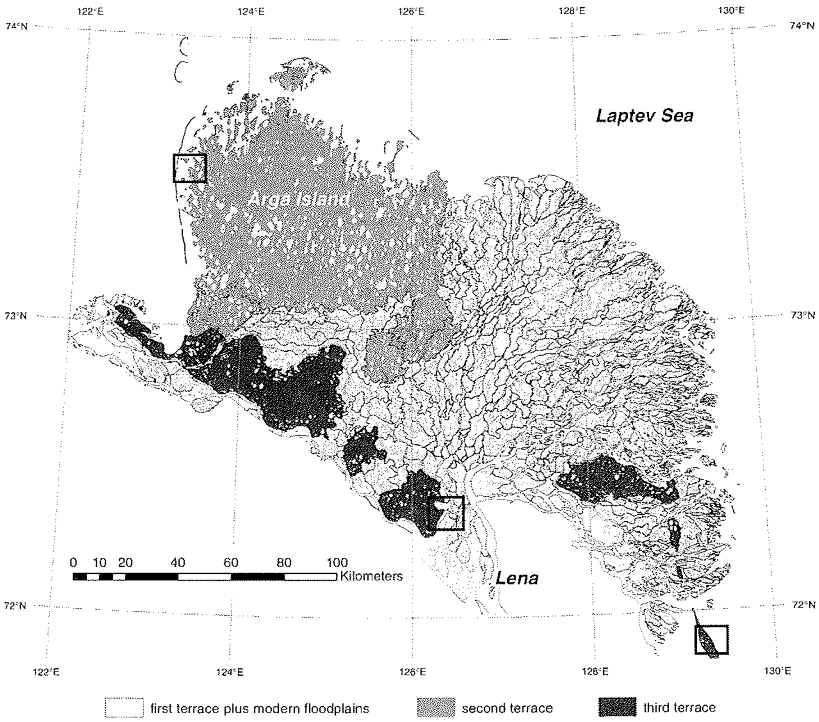


**Figure 3-2:** Geomorphological units (terraces) in the Lena Delta (according to Grigorivev 1993)

Trace Gas Studies:

The investigation of methane and carbon dioxid emission as well as microbiological process studies of methane fluxes were carried out on Samoylov, a representative island in the central part of the Lena Delta. Daily measurements of trace gas emission ($CH_4$, $CO_2$), thaw depth, water level and soil temperature were determined from July 19 to August 24, 2001 at a low centre polygon site. The used method and the main investigation sites were described previously (Pfeiffer et al. 1999).

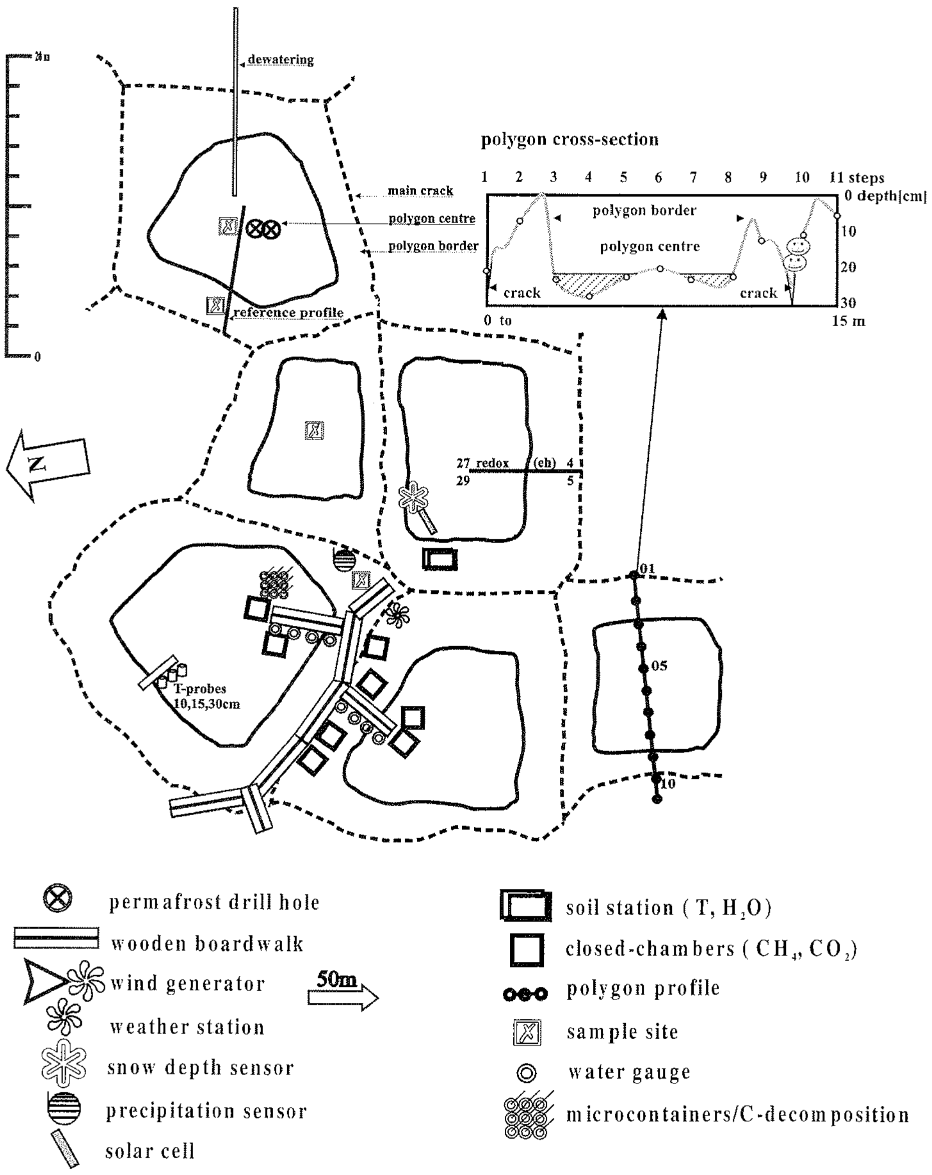


**Figure 3-3**: Soil measurement station with installed research tools on Samoylov Island (N 72°22,186' / E 126°28,826')

**Figure 3-4:** Investigation site of the long term methane and carbon dioxide emission measurements at the low centre polygon site on Samoylov Island. The chambers are placed on the polygon border.

Microbiological Investigations:

The microbial $CH_4$ production and oxidation was investigated considering the natural soil temperature gradient. To determine the *in situ* $CH_4$ production fresh soil material (30 g) from different layers of the polygon centre was weight into 100-ml glass jars, closed gas-tight with a screw cap with septum and flushed with $N_2$. The potential $CH_4$ production activity was investigated after addition of acetate (20 mM) or hydrogen ($H_2/CO_2 \sim 80:20$, v:v) as methanogenic substrates. In the case of *in situ* $CH_4$ oxidation the samples (5 g fresh weight, 50-ml glass jars) were incubated under a methane/air atmosphere (approx. 2000, 7000, 22000 ppm $CH_4$). The prepared soil samples were re-installed in the same layers of the soil profile from which the samples had been taken. Gas samples were taken from the headspace with a gas-tight syringe and analysed for the concentration of methane by gas chromatography in the field laboratory.

Dissolved organic carbon was extracted from soil samples of two vertical profiles (polygon centre and border). The used method has been described by Wagner et al. (2000).

$CH_4$ and $CO_2$ concentrations were determined with a Chrompack (GC 9003) gas chromatograph in the field laboratory. The detailed configuration was described previously (Wagner et al. 2000).

Lake Investigations:

In an effort to improve our understanding of the lakes as a source of atmospheric $CH_4$, we made some investigations at one of the common polygon lakes on Samoylov Island (N 72 °, E 126 °), which was monitored by our Russian colleague K. Abramova (see chapter 4).

The floated chamber method was used to measure methane emissions from the lake. The chambers were made of PVC; the size of the chamber was 50*50*15. The system was the same we used for the soil and was described by Pfeiffer et al. 1999. The chambers were placed directly on the water surface. They got their buoyancy by two floating bodies, which were installed at two sides of the chamber. The chamber sank into the water with the lower 4 cm of the wall. A headspace of 27, 5 l was left above the surface. The chamber remained at each spot for half an hour to collect the emitted gas.

The emissions were measured at three different spots of the lake. First, on the shore, where the grass vegetation from the sediment reached the water surface. Second, in three metre distance from the shoreline where some *Hippuris vulgaris* shoots reached the surface. And third, in the middle of the lake, where no vegetation reached the surface. An additional chamber was lowered to the bottom, to measure the emission directly out of the sediment. This chamber was left on the ground for 48 h.

**Figure 3-5:** The polygon lake with the floating chamber in the middle of the lake.

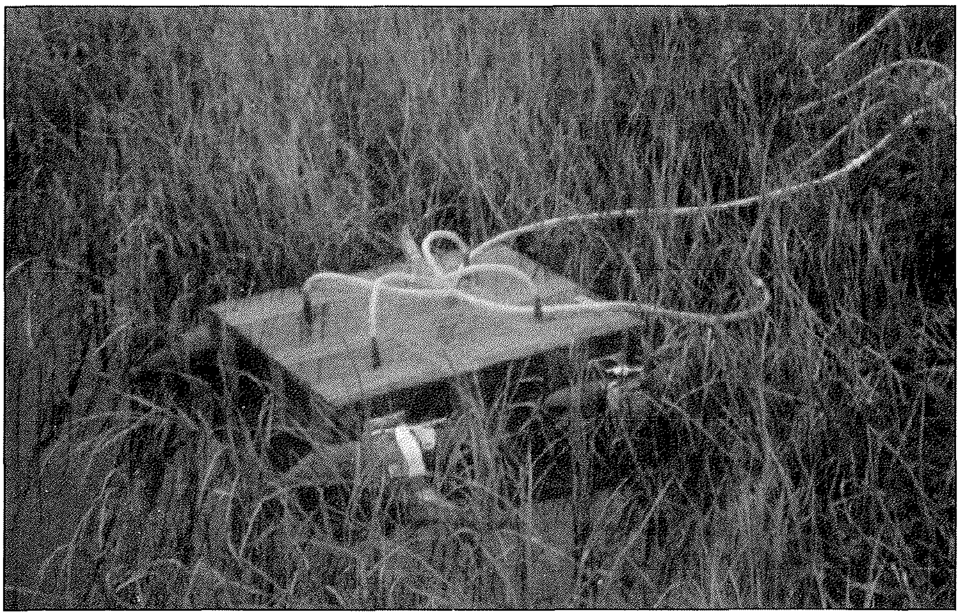

**Figure 3-6:** Floating chamber at spot 1 (shore of the polygon lake).

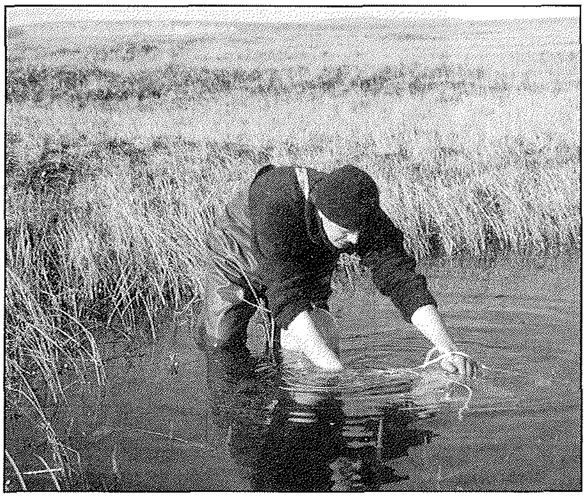

**Figure 3-7:** Lowering the chamber to the ground

Water sampling:

Water samples for the gas analysis were taken from just below the surface. 50 ml of water were sampled in glass jars. After filling them wirh 50ml water and adding 18 g of NaCl the jars were hermetically sealed. In the laboratory the samples were shaken for 1 minute and the methane concentrations in the headspace were measured with the gas chromatograph.

Additionally water sample of 500 ml for the FISH was taken and filled in a sterile PE-bottle. Three aliquots of 100 ml of this water were filtered through white polycarbonate filters (diameter, 47 mm; pore size, 0.2 µm) by applying a vacuum. The concentrated cells were subsequently fixed by covering the filter with a 4% paraformaldehyde solution at room temperature for 30 minutes. The fixative was removed by applying vacuum. After 3 ml phosphate-buffered saline and 3 ml distilled water was added and removed by vacuum the filters were stored and transported at room temperature.

Lake sediment sampling:

Sediment cores were taken with a sediment corer. Several cores were taken: for geochemical analysis, micro- and molecular biological studies, and in-situ methane-concentration measurement. The sediment cores were divided into subsamples which were filled in plastic jars. The sediment for the micro- and molecular biological analyses was stored and transported in frozen state. The subsamples for the determination of the in-situ methane concentration were filled in gas-tight glass jars.

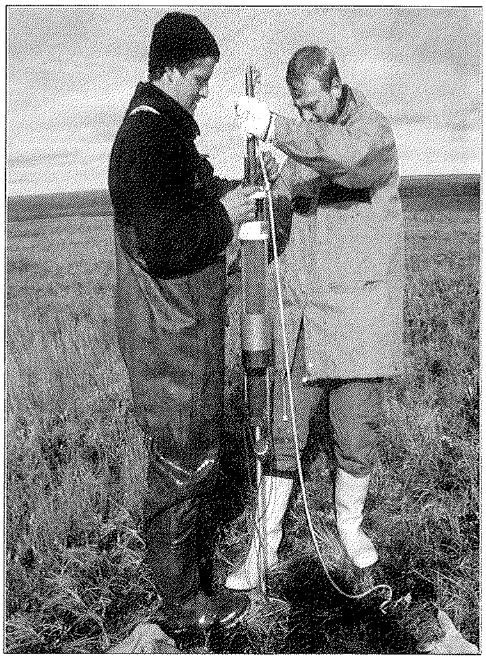

**Figure 3-8:** Getting the sediment out of the corer

Permafrost sediment and ice wedge sampling:

For the first time ice wedges were sampled with the ice core drill "Giffy" of Fa. Niederreiter (see Figure 3-10). Horizontal drilling proceeded successfully; but during vertical drilling problems occurred because the chipping was not led away properly. Melting and re-freezing of the chipping complicated the drilling and impaired the quality of the sample core. The problem could be solved by drilling a support hole so that during the subsequent, overlapping sample drilling the chipping could be led away into the support hole. By this, sample cores of good quality of up to 0,5 m length could be obtained.

The sediment corer ("Kleinbohrgerät", AWI Potsdam) was used for altogether 5 drillings in permafrost (see Figure 3-9). On several occasions problems occurred with the motor driving the drilling station, which, however, could be solved on the spot. The motor iwas taken back to Germany for maintenance.

Three different drilling heads were tested; only one proved to be usable under the prevalent conditions. However, also this drilling head needs to be improved. The main problem turned out to be the controlled leading away of the chipping; frequently the sample core was broken because of jammed chipping in the drilling head. Cores could practically not be taken from sediments with high ice content. Already before the end of the drillings, clear signs of wear became visible on the drilling head. For further drillings, replacement drilling heads are needed. Additionally, it is desirable to use drilling heads of different diameter, so that drillings without additional widening of the drilling hole can be made. This would clearly decrease the time and effort needed for drilling. The maximum depth reached was 8,5m; with additional stakes, drilling down to two or three times this depth seems possible. Another permafrost drilling was carried out with a Russian drilling station. Due to technical problems, only one drilling of 4,5m depth could be made.

**Figure 3-9:** Drilling in permafrost sediments

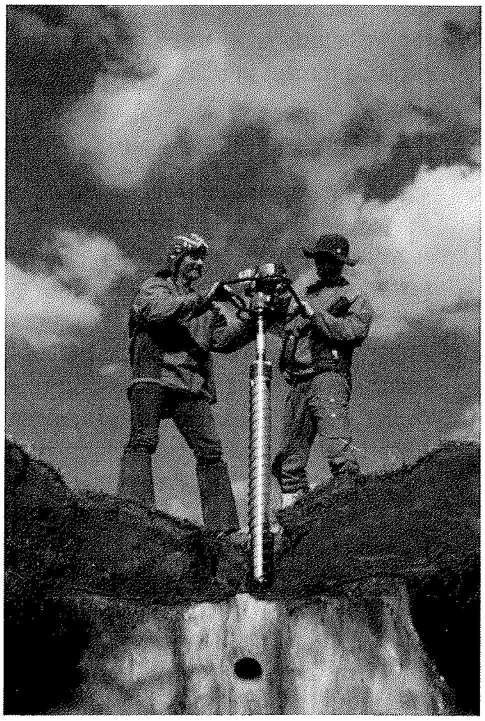

**Figure 3-10**: Ice wedge drilling

The storage of permafrost- as well as ice core samples in the field proved to be problematic. For this, "cellars" needed to be dug in ice wedges, in which the samples were to be kept at about 0°C. However, this way of storage was not optimal, because due to high temperatures (> 20°C) and strong precipitation water collected in the ice cellars and increased the temperature.

For the future it should be thought about whether ice wedge and permafrost drilling should better be carried out during winter months (April, May). During this time of the year proper cooling could easily be guarantied, and many other problems connected with outside temperatures above 0°C could be avoided.

## 3.3 Preliminary Results

A main objective of the soil related studies in the Lena Delta is the quantification of trace gas emission from permafrost-affected landscapes. Ecosystem fluxes of $CO_2$ and $CH_4$ are primarily controlled by spatial variability of soil properties. During the expedition Lena Delta 2001, we investigated variability, spatial distribution and genesis of soil types in the central Lena Delta to provide a basis for the studies on trace gas fluxes. A focus was set on quantity and quality of organic matter in soils.

### 3.3.1 Recent soil studies

Soils of Samoylov Island:

A reversed map of the soil of Samoylov Island is given in figure 3-11. The first terrace above floodplains in the eastern part of Samoylov Island is covered rather homogenously by the soil complex *Glacic Aquiturbels / Typic Historthels*. The *Typic Historthels* (LD01-E04, LD01-L08) are situated in the depressed centre of low-centred ice-wedge polygons characterised by a water level directly at the soil surface and predominant anaerobic accumulation of organic matter. The *Glacic Aquiturbels* (LD01-E05, LD01-L07) are situated at the elevated borders of the polygons and are characterized by a distinctly deeper water level, lower accumulation of organic matter, and pronounced cryoturbation properties. A typical cross-section of a low-centred polygon is shown in figure 3-12.

Only close to the erosion cliffs various drier soil types can be observed. The soil complex *Psammentic Aquorthels / Psammentic Aquiturbels* (LD01-E06, LD01-E07) is typical where due to thermoerosion high-centred polygons are developed. *Typic Psammorthels* (LD01-E03) can be found on surfaces where recent accumulation of eolian sands takes place.

The floodplain in the western part of Samoylov Island is characterised by very diverse soil types. On elevated sand ridges and near to the shoreline, *Typic Psammorthels* (LD01-L02, LD01-L05) were found. In former river channels and depressed areas, Psammentic Aquorthels (LD01-E01), *Typic Aquorthels* (LD01-

LD01), *Ruptic-Histic Aquorthels* (LD01-L05) or *Fluvaquentic Fibristels* (LD01-L03) are situated depending on soil moisture conditions.

Soils of Sardakh Island:

On the first terrace of Sardakh Island, like on Samoylov Island low-centred polygons are situated. However, the soils contain more organic matter. *Glacic Histoturbels* (LD01-S01) are situated at the polygon rims and *Fluvaquentic Fibristels* (LD01-S02) in the polygon centres.

Soils of Kurungnakh Island:

The soils on Kurungnakh Island, which is built up by sediments of the third terrace above floodplains, are characterised by a silty-loamy texture, a high content of well-decomposed organic matter, and wet conditions. Low-centred polygons with a weak microrelief are developed. *Typic Hemistels* (LD01-K02, LD01-K04) are situated in the polygon centres, *Glacic Historthels* (LD01-K03, LD01-K05) are situated at the weakly elevated polygon rims. On top of a pingo, semi-gleyic *Typic Aquorthels* (LD01-K01) can be observed.

An overview of all observed soil types is presented in Table A3-6. Detailed soil profile descriptions are provided in the table collection Table A3-7. All samples are listed in Table A3-1. Soil-chemical and microbiological studies as well as the preparation of a revised soil map are in progress. Additionally, the experiences from our study will be used to develop an instruction for correlation of the different soil classification systems.

Biomass and C-decomposition

In the wet centre f the polygon (reference plot 2) 210 g fresh biomass per square meter was produced by Carex concolor, which is the dominant vascular plant. The mean value for the aboveground biomass amounts to 82 g/m$^2$ (dry weight) at the end of the vegetation period 2001.

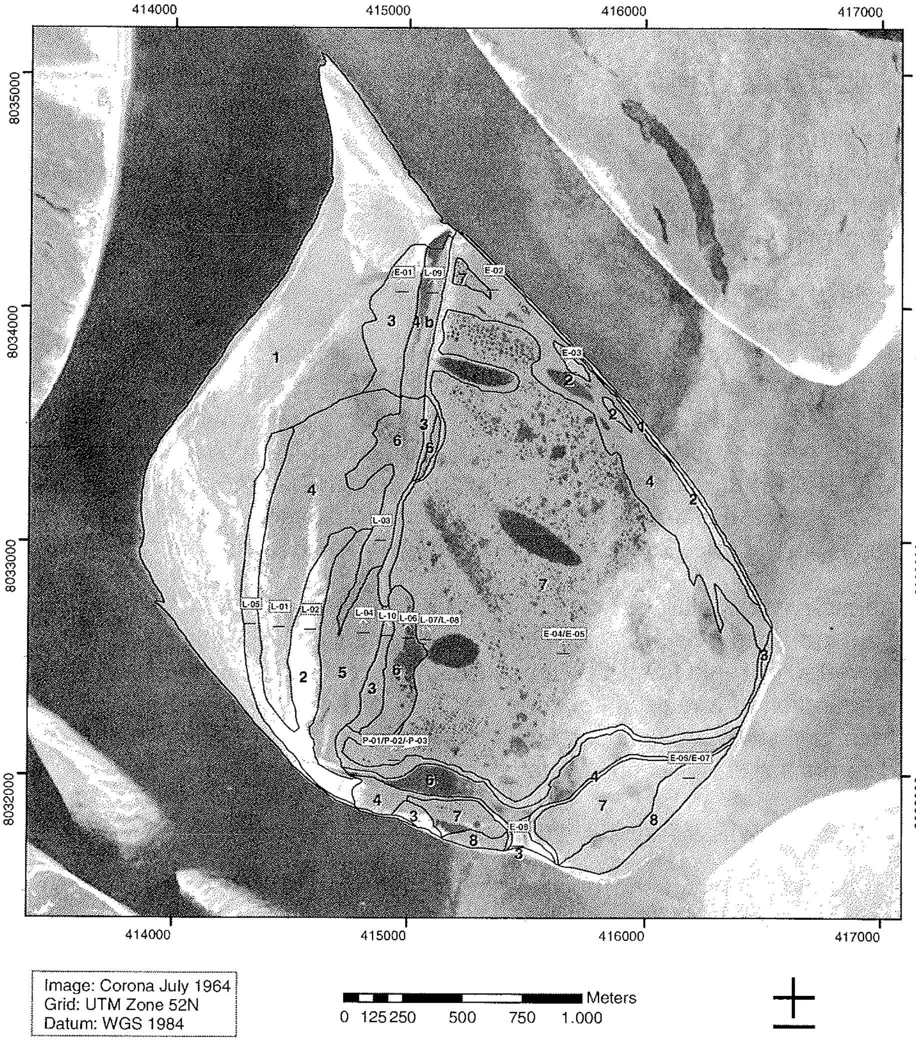


**Figure 3-11:** Soil map of Samoylov Island. Photograph was produced in July 1964 by a Corona satellite. In the south-east of the island, intense erosion of the first terrace above floodplains during the last 37 years can be recognized. Stars: locations of reference profiles. Black numbers: soil types. Legend:

| | | | |
|---|---|---|---|
| 1 | non-soil (beach) | 5 | Ruptic-Histic Aquorthel |
| 2 | Typic Psammorthel | 6 | Fluvaquentic Fibristel |
| 3 | Psammentic Aquorthel | 7 | Complex Typic Historthel / Glacic Aquiturbel |
| 4 | Typic Aquorthel | | |
| 4b | Silty Typic Aquorthel | 8 | Complex Typic Aquorthel / Typic Aquiturbel |

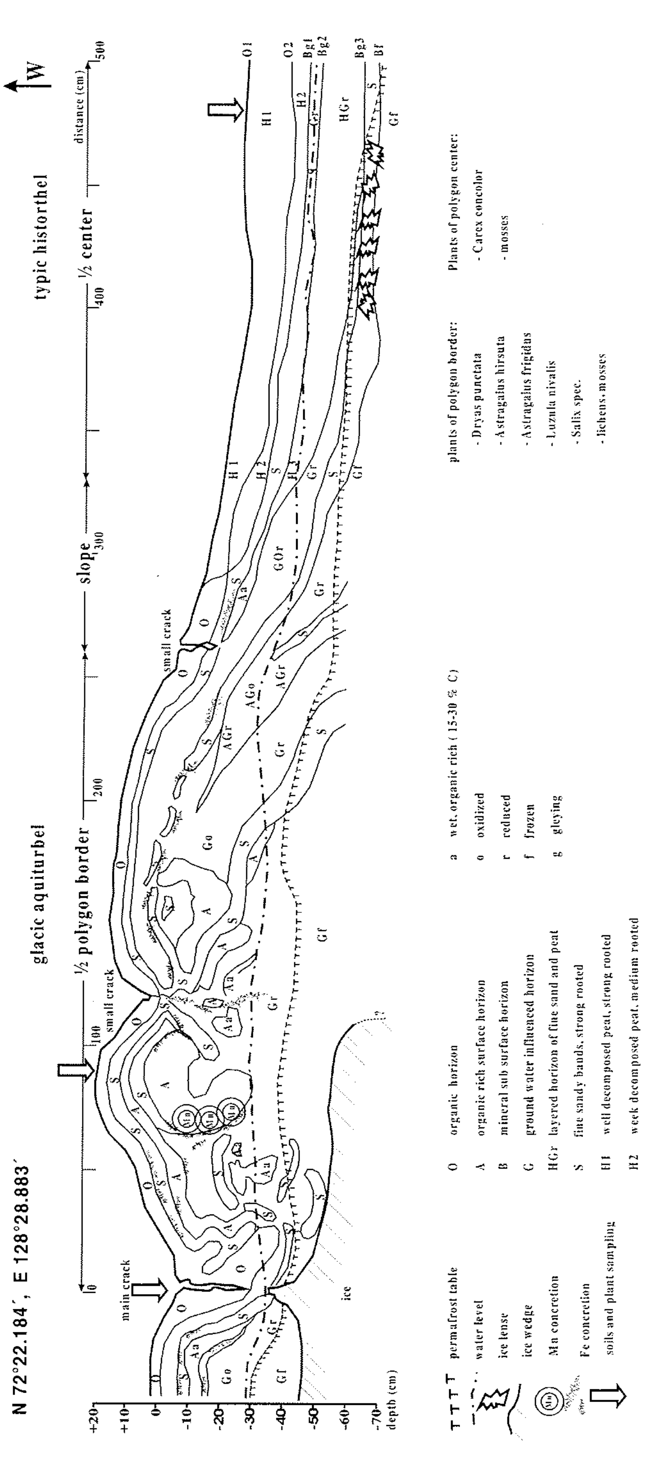


**Figure 3-12:** Cross-section of a low-centred polygon (reference soil profile 2001), Samoylov, Lena Delta

### 3.3.2 Methane emission

The closed chamber measurements of methane emission from the centre of a wet polygon tundra showed a relatively high methane release between 19 to 104 mg $CH_4$ $d^{-1}$ $m^{-2}$ (average 51 mg $CH_4$ $d^{-1}$ $m^{-2}$). Although the season 2001 was extremely warm and dry compared to 1999 (11.2 °C) and 2000 (8.8 °C) with an average temperature of 12 °C, the average methane emission (50 mg $CH_4$ $d^{-1}$ $m^{-2}$) was in the same order of magnitude as during the years before (1999: 37 mg $CH_4$ $d^{-1}$ $m^{-2}$/2000: 69 mg $CH_4$ $d^{-1}$ $m^{-2}$). In contrast to the polygon centre the emission rate of the polygon border was about 2.5 to 3 times higher than in 1999 (3.2 mg $CH_4$ $d^{-1}$ $m^{-2}$) and 2000 (4.0 mg $CH_4$ $d^{-1}$ $m^{-2}$) (Figure 3-13).

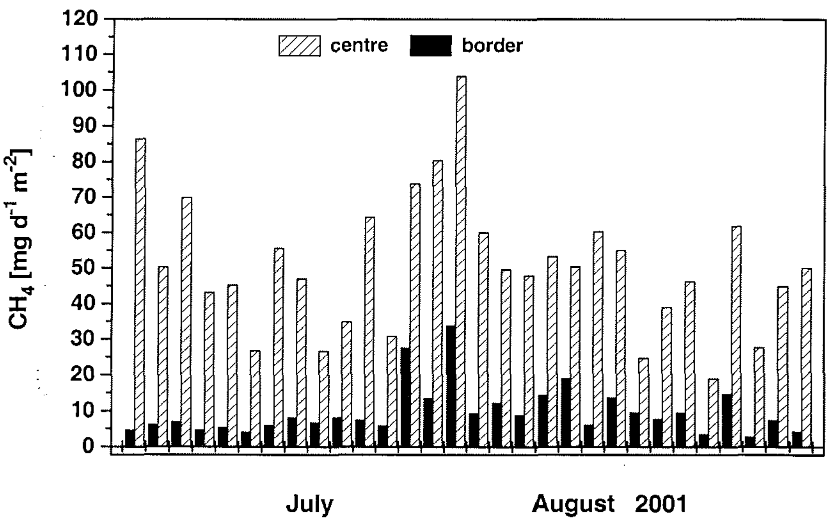


**Figure 3-13:** Methane emission of the low-centred polygon site in July and August 2001.

The maximum thaw depth was reached in August just like the years before, but the absolute depth was larger: The thaw depth of the centre was in average 39 cm and the border had a depth of about 49 cm (Figure 3-13).

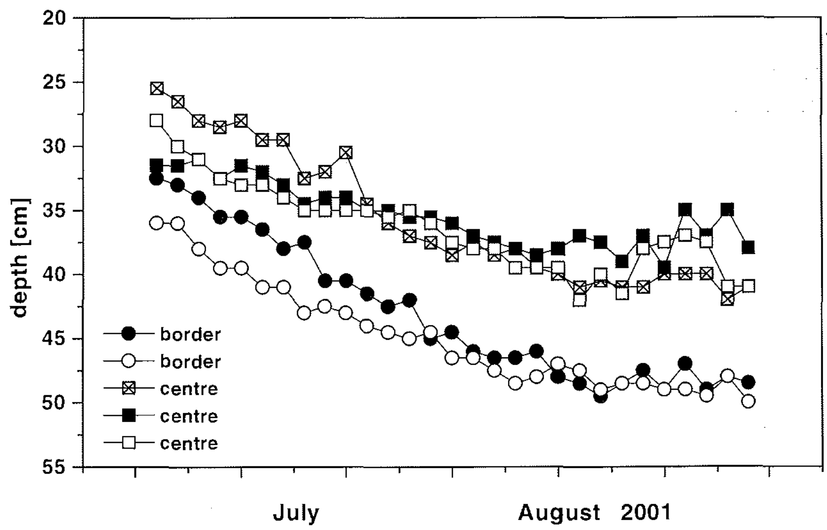


**Figure 3-14:** Thaw depth of the low-centred polygon site in July and August 2001.

### 3.3.3 *In situ* studies on $CH_4$ fluxes

The investigation of *in situ* methane production showed for the whole profile (Typic Historthel) of the polygon centre activity of methanogens (Figure 3-15). Without any additional substrate the methane production varied between 0.1 to 1.3 nmol $CH_4$ $h^{-1}$ $g^{-1}$. The highest activity could be determined in the peat layer of the top soil. After addition of methanogenic substrates (acetate, $H_2$), the activity drastically increased. The $CH_4$ production in the peat layer with $H_2$ as substrate was about 1.5 times higher (11.3 nmol $h^{-1}$ $g^{-1}$) compared with acetate (7.8 nmol $h^{-1}$ $g^{-1}$) as substrate, while above the permafrost table at temperatures between 0°C and 3°C the activity were in the same order of magnitude (approx. 1.2 nmol $h^{-1}$ $g^{-1}$) with both substrates. This result indicated a methanogenic microflora adapted to low temperatures in the cold permafrost habitat.

The $CH_4$ oxidation is controlled, among other factors, by soil moisture, which was reflected by the seasonal variability of the $CH_4$ emission. If the soil was water-saturated like at the beginning of the season, $CH_4$ oxidation was only detectable in the top soil (0,6 nmol $h^{-1}$ $g^{-1}$). This resulted in a high $CH_4$ emission rate (approx. 50 mg $d^{-1}$ $m^{-2}$, compare Wagner et al. 2000). In the course of a seasonally sinking water level, the top horizons of the soil became drier and changed to oxic conditions like in August 2001. Under these conditions, $CH_4$ oxidation activity was observed for almost the whole vertical profile (Figure 3-16). The $CH_4$ oxidation reached an activity of 2.8 nmol $h^{-1}$ $g^{-1}$, which was in the same range as the $CH_4$ production. Nevertheless, $CH_4$ emission occurred in the order of 50 mg $CH_4$ $d^{-1}$ $m^{-2}$, because of the low $CH_4$ turnover rate at *in situ* concentrations of the $CH_4$ oxidizing bacteria (results are not shown in this report). Additionally, parts of $CH_4$ are released to the atmosphere via the vegetation, so that the $CH_4$ oxidation in the top soil is bypassed (compare Wagner et al. 2000).

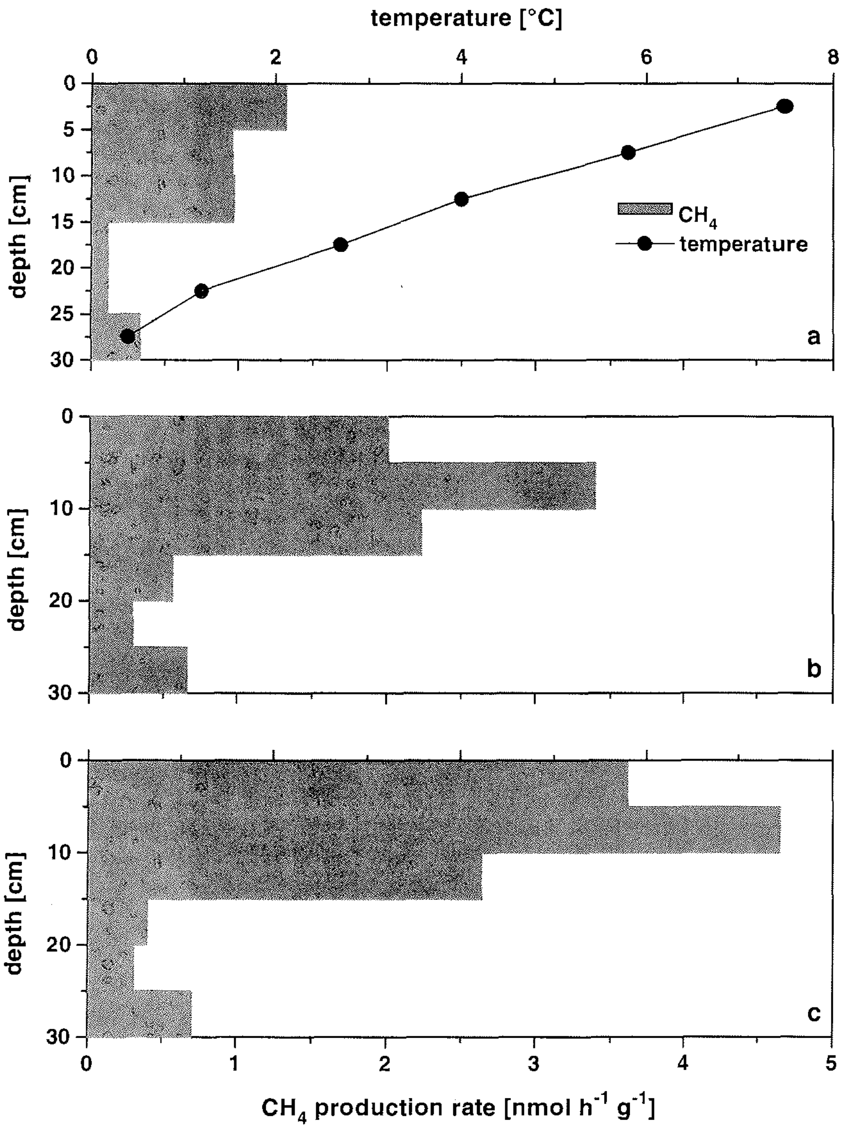


**Figure 3-15:** Vertical profiles of in situ methane production and soil temperature, active layer, polygon centre, a. without any additional substrate, b. with acetate (20 mM) as a substrate and c. with hydrogen ($H_2/CO_2$, 80:20, v:v) as a substrate.

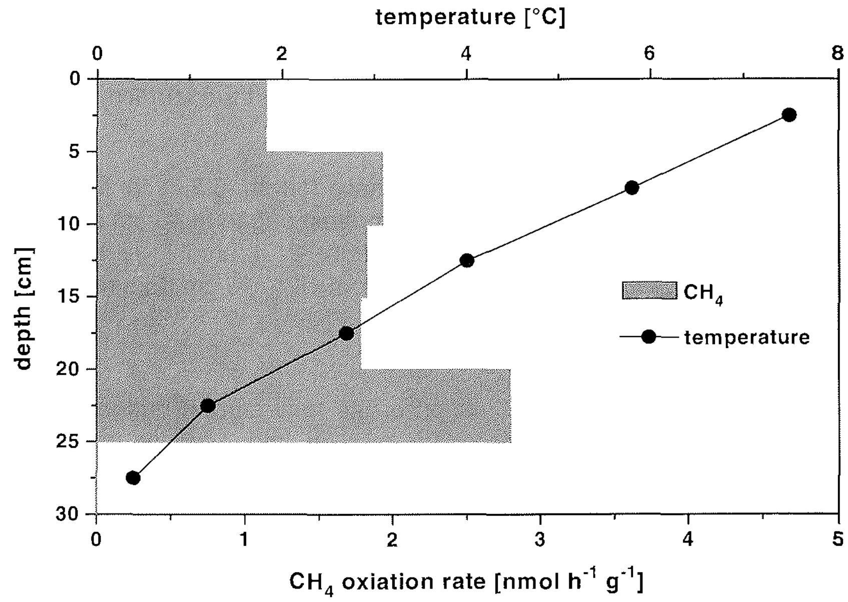


**Figure 3-16:** Vertical profile of methane oxidation at *in situ* $CH_4$ concentrations and temperature

### 3.3.4 $CH_4$ fluxes in polygon lakes

For the water of the Polygon Lake we measured a temperature of 5.8 °C and a pH-Value of 7. The $CH_4$-content of the surface water was 0.3 µmol $l^{-1}$.

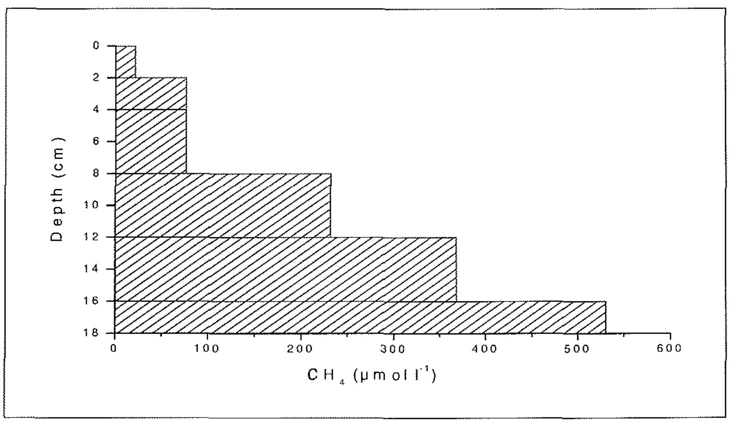


**Figure 3-17:** Methane content in different depths in the sediment of the polygon lake on Samoylov Island

The $CH_4$ emission of the water surface seemed to depend on the region of the lake. At the shore of the lake we calculated $CH_4$ emissions of 5.13 mg $m^{-1}$ $d^{-1}$. In the middle of the lake, where no vegetation reached the surface, we measured a $CH_4$ emission of only 0.32 mg $m^{-1}$ $d^{-1}$.

In the sediment the temperature decreased from 5.2 C in the upper first centimetres to 3.6 C in 15 cm depth. Permafrost began at 46 cm soil depth. The $CH_4$-content in the sediment increased from 21.4 µmol $l^{-1}$ in the upper two centimetres to 530.3 µmol $l^{-1}$ in the depth from 16 to 18 cm (Figure 3-17).

### 3.3.5 Permafrost and ice wedge coring

In order to obtain a better estimation of the total carbon budget for the Lena Delta region, it was also necessary to take into account the amounts of methane which are stored in the huge reservoirs of the ice rich permafrost sediments and ice wedges. Therefore, a first permafrost drilling on Samoylov, on Sardakh and on Kurungnakh has been carried out.

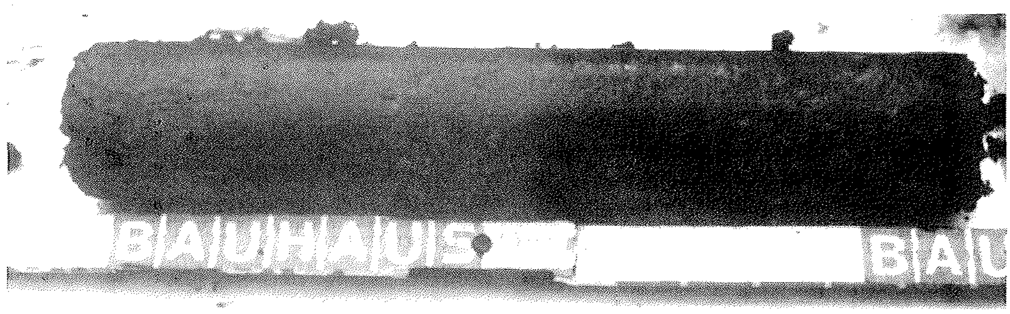


**Fig. 3-18** Sample core of good quality from permafrost

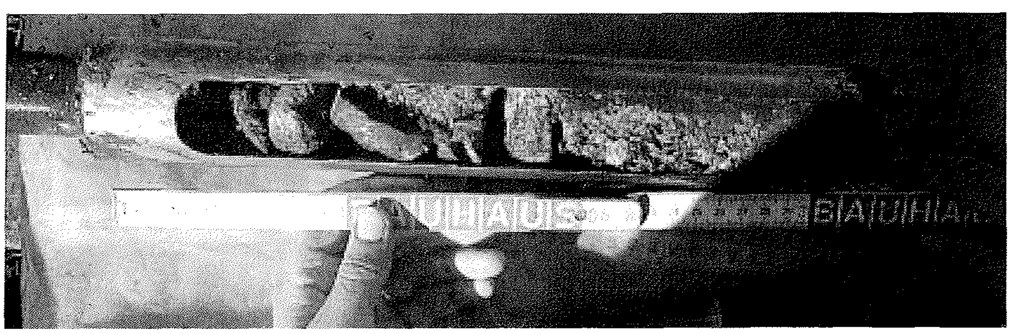

**Fig. 3-19:** Destroyed sample core from sediment with high ice content

Due to the ice content the quality of the drilled core was very different: The higher the ice content the more destroyed was the core material. Compare Figures 3-18 and Figure 3-19.

The main characteristics of drilling sites on Samoylov and Kurungnakh are shown in the exposure schemes ( Figure 3-20 and Figure 3-21). The data from site Kurungnakh will be correlated with the results of previous expeditions of Lena 2000 (Schirrmeister et al. 2001). The temperature measurements of the bore holes were made the Russian colleagues.

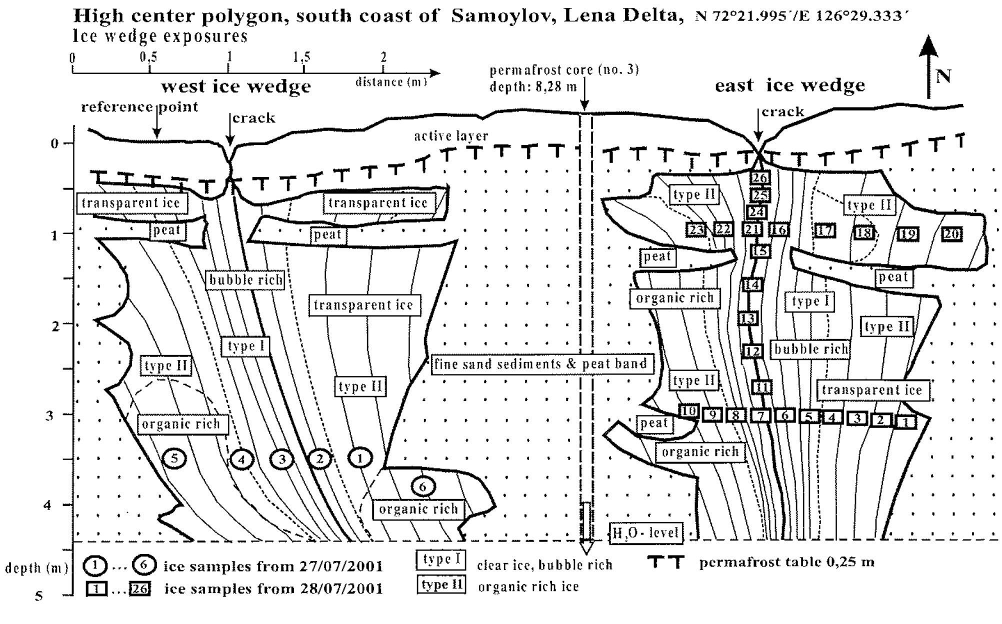


**Figure 3-20**: Exposure and drilling sites on Samoylov Island, Lena Delta

The determination of the gas amount and the gas concentration in the permafrost samples and the ice wedges started in the field and have to be finished in Germany. All permafrost and ice wedge samples (see Table A3-8 and A3-9) were transported under frozen conditions to Germany for further geochemical, microbial and molecular ecological analysis.

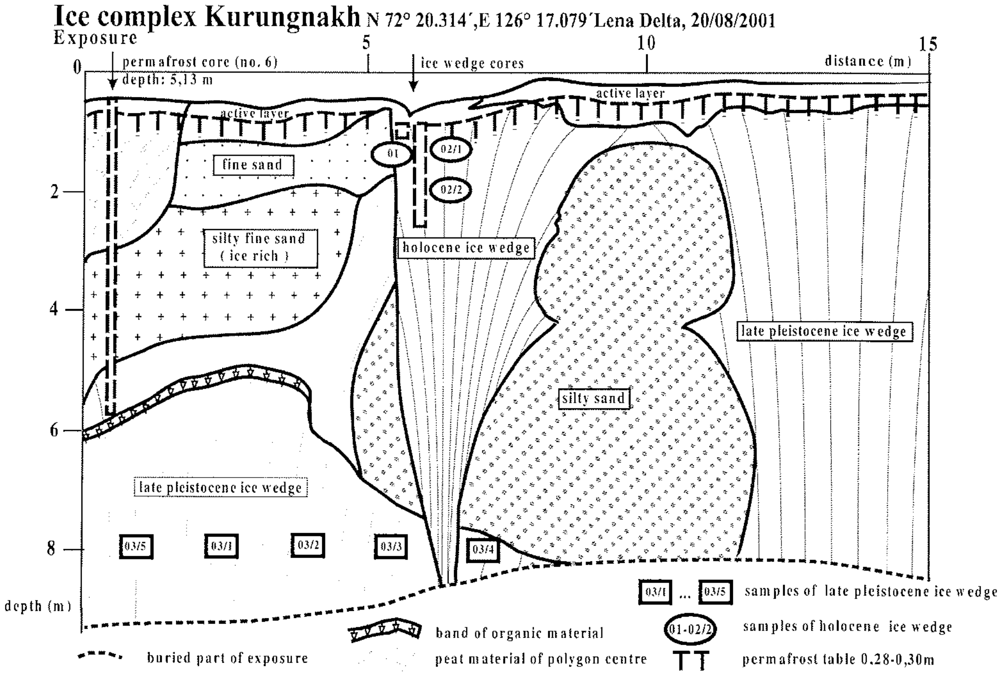


**Figure 3-21**: Exposure and drilling sites on Kurungnakh Island, Lena Delta

## 3.4 Further investigations

The soil related investigations contribute to the understanding of the modern processes of the sensitive ecosystems. They are the base for estimating the impact on possible global climate changes. The investigations of the regional methane emission from the arctic tundra in the Lena Delta will be continued in the next year by using an eddy correlation system.

The studies will be continued in Germany with the fresh soil material and the water samples from the Expedition Lena 2001. Especially the geochemical and microbial analysis and characterization of the soil core material from Samoylov, Kurungnakh and Sadakh is going to start on arrival of the frozen material. In addition, the analyses of dissolved organic carbon, the isotopic composition of methane gas samples and soil organic matter as well as the phospholipid fatty acid profiles are still in progress. Furthermore, the isolation and characterization of methanotrophic and methanogenic microorganisms which are adapted to the low in situ temperature is a time-consuming process, that has to go on in the future.

Since substantial parts of the carbon conversion are catalyzed exclusively by microorganisms, the search for key-organisms as well as the identification and diversity studies of the microbial community is an essential future task for the understanding of carbon fluxes in permafrost soils under changing climate conditions. The expected results represent the necessary data base for further investigations like studies on permafrost associated gas hydrates or special research about the adaptation strategies and long-term survival of microorganisms in extreme habitats.

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# 4 Biological Research in the Lena Delta

*(E. N. Abramova, Yu. N. Sofronov, N. Abramson)*

## 4.1 Introduction

The State Lena Delta Reserve in Tiksi carried out several investigations on important ecosystem parts of the whole Lena Delta. In the frame work of the Expedition Lena 2002, the zooplankton of different lakes and the bird distribution in the Lena Delta was monitored. Additionally, the lemming distribution in the central Lena Delta was investigated.

## 4.2 Investigation of zooplankton from tundra water basins in the Lena Delta

*(E. N. Abramova)*

### 4.2.1 Objective

Zooplankton plays a key role in the transformation of energy and biotic cycles determining productivity of water basins. During the joint Russian-German expedition "Lena-2001", we studied zooplankton composition, its density and biomass distribution, age structure and seasonal dynamics of zooplankton populations inhabiting freshwater tundra basins in the Lena River delta. Additionally, we planned to obtain the data on seasonal zooplankton production in tundra water basins and determine the input of organic matter produced by planktic organisms.

### 4.2.2 Material and Methods

During the summer of 2001, from July 23 till August 25, we collected and analiezed 24 zooplankton samples from three water basins on the Samoilovskii Island: polygon lake, terrace lake and Olenekskaya channel. The sampling was carried out with a periodicity from 3-4 days. Besides, 6 samples were collected in the lakes of the Amerika-Khaya and Buor-Khaya islands. Sampling was performed by filtering 100 liters of water through a 100 •m meshsize net and fixation with 70% alcohol. The whole sample or parts were studied in the Bogorov's camera, and the abundance of organisms was calculated. We determined species, sex and moulting stages. The data were recalculated to 1 $m^3$ of water. To identify individual weights of organisms, we used the formula: $W=ql^b$, where W is body weight, l – body length (mm), q – weight at 1 mm body length, b – index.

### 4.2.3 Preliminary results

The pelagic fauna of freshwater basins on the Samoilovskii Island consists of 51 species, including Rotatoria – 23 species, Copepoda – 17 species, Cladocera – 11 species together with Nauplii Copepoda and representatives of Ostracoda and Anostraca, which were not determined to species level. Planktic assemblage from the Olenekskaya channel is represented by 38 species, 20 of which belong to Rotatoria. The latter were also found to dominate the terrace lake planktic assemblage (18 among 35 identified species). Copepoda (14 species) are the most abundant in polygon lake assemblage represented by 30 species.

In the Olenekskaya channel, maximum zooplankton abundance (18-20 thousand ind./$m^3$) and biomass (0.3-0.4 g/$m^3$) were recorded in late July – early August at 20°C water temperature. Rotatoria predominated there comprising about 80% of the total abundance, while Cladocera had a 90%-share in the total zooplankton biomass. The average abundance and biomass in the Olenekskaya channel equaled 11 thousand ind./$m^3$ and 0.2 g/$m^3$, respectively.

Two peaks of zooplankton abundance and biomass were recorded in the terrace lake. The first peak was observed in the last decade of June at 13°C water temperature – 15 thousand ind./$m^3$ and 0.6 g/$m^3$, respectively. The second peak was recorded in the last decade of August at 8°C water temperature – 17 thousand ind./$m^3$ and 1.1 g/$m^3$, respectively. In both cases, growth of zooplankton abundance is related to intensive reproduction of Copepoda (Eurytemora genus), that comprised 80% of the total abundance and 95% of the total biomass of plankton in the samples. During the whole period of observation, the average zooplankton abundance and biomass in the terrace lake were 10 thousand ind./$m^3$ and 0,6 g/$m^3$, respectively.

The highest zooplankton abundance was observed in polygon lakes. At the beginning of August, when water temperature was 16°C, it reached 42 thousand ind./$m^3$. Zooplankton biomass was 6.0 g/$m^3$. The average zooplankton abundance was 19 thousand ind./$m^3$, and biomass - 2.5 g/$m^3$. Copepoda were the most abundant (more than 80% of zooplankton in the samples), of these different stages of Diaptomidae were dominant. Cladocera had the highest biomass, and female *Daphnia pulex* comprised 90% of the total plankton biomass.

### 4.2.4 Further Investigations

Zooplankton of the Olenekskaya channel and terrace lake on the Samoylov Island is taxonomically more diverse than zooplankton of the small polygon lakes. Zooplankton abundance in polygon lakes on Samoylovi Island is twice as high as in the other studied water basins, while biomass is 4-12 times higher. Besides the data on zooplankton abundance, biomass, and age structure of population, we are going to analyze productivity and lifetime of different moulting stages in order to estimate seasonal zooplankton production in different tundra water basins of the Lena delta.

## 4.3 The avifauna of the northwestern Lena Delta

*(Yu. N. Sofronov)*

### 4.3.1 Methods

Field work was carried out from July, 18 until August, 1 in the northwestern Lena-Delta. The islands under-foot-survey were as follows, Babaryna-Belk'ey, Syargalakh-Belkee and northwestern part of Arga-Muora-Sise. Visual observations were done using 10-fold Bristol binoculars. The surveyed distance was 28 km. We used the method of average location range, which is based on the registration of birds together with distance from the observer synchronously. The survey strip was corrected according to local relief. Survey strip was not wider than 100 m for passerines, 200 m for middle sized waders, 400 m for large waders, and 800 m for divers, ducks and gulls. A bird list is given according to Stepanyan (1990), see appendix Table A4-1.

### 4.3.2 Results and Discussion

*Species composition*

Totally 22 species were noted which belonged to 5 ordo as follows Gaviiformes – 2 species; Anseriformes – 3 species; Galliformes – 1 species; Charadriformes – 14; Passeriformes – 2. Twelve species, or 54,55% nested in the area among them. They are Gavia stellata, G. arctica, Somateria spectabilis, Lagopus mutus, Larus argentatus, L. hyperboreus, Xema sabini, Sterna paradisaea, Pluvialis squatarola, Calidris minuta, Calcarius lapponicus, Plectrophenax nivalis. Two more species Arenaria interpres and Charadrius hiaticula (9,09%) were probably nesters according to their defending behaviour. Oversummering species were Clangula hyemalis, Polysticta stelleri, Stercorarius parasiticus (13.62%), they were present in the area, but did not show express breeding behaviour. Calidris alba was recorded as a flying species. Four more species (18.18%) were not distinguished by their status, like Phalaropus fulicarius, Phylomachus pugnax, Calidris ferruginea, C. alpina.

Waterfowl and waders dominated the bird complex. Gaviiformes, Anserformes and Charadriformes provide 86.36% from the number of birds found. Other groups (Galliformes and Passeriformes) provide 13.64%. In late July Calidris minuta and Larus argentatus were the most abundant, making 28.95 and 18.29% from the number of birds recorded. Regular species were Xema sabini, Somateria spectabilis, Lagopus mutus and Pluvialis squatarola, they provided 6.48, 5.90, 5.90 and 4%, accordingly. Other species received a share of 0.19 to 3.24% of recorded birds. Bird population composition was influenced by mass staging of pre-migrating Calidris minuta, which have been observed on the sandy beach of south-west Babaryna-Belk'ey Island.

*Number and Distribution*

Babaryna-Belk'eye Island

It is the most detailed surveyed island. The avifauna numbers 13 species. We located 48 nests of Larus argentatus, 4 - Larus hyperboreus, 6 - Xema sabini (totally 12 pairs were registered in the small gulls colony), 1 - Sterna paradisaea (four pairs presented), 2 - Somateria spectabilis and 1 nest of Lagopus mutus. Additionally, 2 pairs of Arenaria interpres and 2-3 pairs of Charadrius hiaticula presented on the island with features of breeding behaviour. Flocks of Calidris minuta and Calidris alba were observed feeding on the sandy beach on the south-west side of the island. One to two individuals Calidris alpina joined them sometimes.

Non-breeding pair of Stercorarius parasiticus stayed on the island during the entire period of our work. We observed fledged offspring Plectrophenax nivalis in small number. Calidris minuta dominated on the island (40.6% from population) due to aggregation of pre-migrating flocks, although they did not breed there. The number of migrating flocks of Calidris alba was also significant (8.36%). Among breeders, Larus argentatus was the most numerous (28.66%), Xema sabini (7.16%) made a significant proportion. Charadrius hiaticula, Larus hyperboreus, Sterna paradisaea and Lagopus mutus were common and provide 3.88, 2.39, 2.69 and 2.09% of the total population number.

Arga-Muora-Sise Island

Fifteen species were recorded in the northwestern part of Arga-Muora-Sise Island. Gavia stellata, Gavia arctica, Larus hyperboreus, Xema sabini, Sterna paradisaea, Charadrius hiaticula, Calidris minuta, Lagopus mutus nested there. Brood rearing Pluvialis squatarola were common according to our observation over defending adults. Somateria spectabilis, Clangula hyemalis and, probably, Polysticta stelleri oversummered there. We recorded Calidris alpina, C.

ferruginea and Calcarius lapponicus with unknown status. Gavia stellata, G. arctica, L. hyperboreus inhabited of sandy parts of permafrost lakes. Their densities were 0.54, 0.23 and 0.33 ind./km$^2$, accordingly. Non-breeding females of Somateria spectabilis and Clangula hyemalis were present on the same lakes with densities of 1.72 and 2.03 ind/km$^2$. Xema sabini had a density of 1.92 ind/km$^2$. Pluvialis squatarola were common (1.9 - 2 ind/km$^2$) on dry slopes with Dryas-lichen vegetation. Calidris alpina, C. ferruginea и Calcarius lapponicus inhabited sandy parts of the second terrace above flood-plains covered with moss-grass vegetation, with densities of 3.75, 2.5 and 1.0 ind/km$^2$, accordingly. Brood rearing pairs of Sterna paradisaea were found on the side of Sanga-Djie Bay. Two pairs of Charadrius hiaticula were recorded for 1 km of sandy beach on the isthmus of Sanga-Djie Bay.

Syargalakh-Belk'ey Island

Ten species were recorded. Gavia stelleri, G. arctica, Somateria spectabilis, Pluvialis squatarola, Calidris minuta and Calcarius lapponicus breed among them. Stercorarius parasiticus was found oversummering. We also observed females of Phylomachus pugnax and flying young Phalaropus fulicarius of the adult size with uncertain status. Bird population was dominated by Pluvialis squatarola with adensity of 3.13 ind/km$^2$. Somateria spectabilis females were common (density 1.72 ind/km$^2$).

*Breeding*

A colony of 44 nests of Larus argentatus was situated on the hill of 2 m in the mouth of ravine on the south-west side of Babaryna-Belk'ey Island. Single nests (п=4) were located south in the delta. The average nest bowl diameter (п=11) was 468.64 mm (lim 390 - 615); nest diameter (п=11) - 218.64 (lim 205 - 240); height (п=5) - 95 (lim 75 - 115); depth (п=11) - 64.18 мм (lim 46 - 75). The nest distance was from 1.5 to 15 m and averaged 5.7 m. Nests were lined with different parts of cereals with moss and grass as an admixture. Some nests had downs and feathers in lining. Clutches consisted of 1 - 3, on average of 2.36 eggs. Egg dimensions were (n=98) 77.2-66.3 x 54.2-46.3 and averaged 72.13 x 49.97 mm. First pipping was registered on July 25th, the hatching onset started July 28th. Chicks left 14 nests (31.82%) by the 1 of August, on this day 21 nests (47.73%) hatched (early chicks were near the nests while the last ones continued to dry), six more nests (13.64%) were in hatching process. The fate of 3 clutches (6.82%) is unknown: two had 2 cold eggs, one had dead chicks and cold eggs The chick mortality was 7.35%, excluding the last 3 clutches.

A stretched colony of the small gulls Xema sabini and Sterna paradisaea was situated on the southern part of the island. The average nest bowl diameter was (п=5) 127 mm (lim 120 - 135) in Xema sabini. Hatching started on July 18th. On July 19$^{th}$, one nest had 2 dry chicks 1 day old and 1 egg (infertile). Hatching occurred in other nests this date. Hatching was completed by July 21th, all nests were left by July 23th. The broods stayed on the territory of colony until our departure. Two different age chicks had the following sizes on the July 25th: bill length 14.4 and 15.1 mm; tarsus length 27.8 and 26.4 mm; brushes of primaries 0 and 2.9 mm; primaries length 18.3 and 16.7 mm; secondaries length 10.8 and 8.1 mm. One had egg tooth, while the other had none. Three breeding pairs were observed in northwestern part of Arga-Muora-Sise Island on the July 26th. The birds stayed on the middle size lake of irregular form. The lake has lower sides and is situated in a wet depression. Two young brood swam on the lake. One chick from this brood had the following sizes: bill length 17.2mm; tarsus length 28.6 mm; brushes of primaries 14.6 mm; brushes of secondaries 14.4 mm; brushes of tail 7.6 mm.

A newly hatched young of Sterna paradisaea was found on the territory of a small gull colony on July 19th. On August 1th, we caught a chick with a bill length of 17 mm; tarsus length of 15.7 mm; brushes of primaries of 20.2 mm; brushes of secondaries of 15.8 mm; and brushes of tail of 12 mm.

Nests of Larus hyperboreus on the Babaryna-Belk'ey Island were situated along the coast close to the southern side of the island. One nest on the sandy hillock represented a bowl with a diameter of 280 mm and a depth of 58. The nest lining was absent. The clutch consisted of two eggs with dimensions of 78.6x51.9 and 76.3x53.9 mm. Single nests were located also in the northwestern part of the Arga-Muora-Sise Island. They were situated on the islets of permafrost lakes on sandy parts of the second terrace above flood-plain.

Two nests of Somateria spectabilis with complete clutches of 4 and 5 eggs were located on the Babaryna-Belk'ey Island. A nest with 5 eggs was situated on gently slope with less abundant vegetation on the foot of the southern side of the island. The nest bowl diameter was 210 mm, the nest diameter 150 mm, the depth 49 mm. The nest was built from steams and leaves of grass, lined by delicate steams of grass. It contained moderate amounts of downs. The egg size had followingvalues: (n=5) 66.0x45.2, 65.9x45.2, 66.6x45.2, 65.8x45.0 and 64.9x44.1 mm. There were no eggs and ducklings in this nest on July 28th. Successful hatching was determined by the presence of membranes. Another nest with 4 eggs was found in the central part of the island. Two eggs were pipping on July 28th. The female was still attendant to the nest on July 30th, but brood left the nest by July 31th. Membranes were found in the nest.

On July 31th we registered a brood with one 2-3 days old duckling on Syargalakh-Belk'ey Island. Two additional females stayed together with brood, but left with the observer approach. Another brood of 6 youngs was older. The ducklings were larger and reached a bit less than half of adult size. The nesting of eiders was influenced by gull Larus and Stercorarius parasiticus predation. During the survey we located two avians destroying eggs of Somateria spectabilis.

Breeding pairs of Gavia stellata were observed on the Syargalakh-Belk'ey Island and in the northwestern part of the Arga-Muora-Sise Island. They prefer small lakes with a diameter not more than 50 m on sandy parts of the second terrace above flood-plain. Two located nests had the following dimensions: nest bowl diamater 380 and 330 mm; nest diameter in both 220 mm, depth of one 47 mm, second one was flat. The first nest had a clutch of 2 eggs (74.0x44.8 and 75.2x44.6 mm). The second clutch hatched on July 26$^{th}$. A dry chick was found within 0.7 m from the nest, second chick had hatched.

Gavia arctica was distributed similarly to G. stellata, but preferred larger lakes with diameters not less than 700-800 m. The only nest with 2 eggs was located on the Syargalakh-Belk'ey Island on July 31th. The nest was flat, nest bowl diameter was 350 mm, nest diameter 225 mm. The nest was situated on the moss bed within 50 cm from water. The egg size was 82.2x 51.3 and 81.5x50.8 mm. Both species of divers flew to feed on the sea shallow in 3 – 5 km from nests.

In the third ten-day period of July, chicks of Calidris minuta 3 – 4 days old were registered on Arga-Muora-Sise Island. The chick, which was caught on the Syargalakh-Belk'ey Island on July 31th, had the bill length of 15.0 mm; tarsus length 21.4 mm; brushes of primaries 34.2 mm; brushes of secondaries 21.8 mm; brushes of tail 13.7 mm.

#### 4.3.3 Conclusions

Lower population estimations and numbers were seemingly related to the absence of suitable habitat types for waterfowl. However, nesting success occurred in gulls Larus (Larus argentatus, L. hyperboreus), which nested with normal density. Successful hatching also took place in small gull nests (Xema sabini, Sterna paradisaea). Divers (Gavia stelleri, G. arctica) nested on suitable lakes with normal density.

Breeding conditions were unfavourable for some waders. Pluvialis squatarola was the most common in suitable biotopes. Calidris minuta also was not that numerous, although it made the main part in bird population. Other waders like Phalaropus fulicarius, Phylomachus pugnax, Calidris ferruginea, Calidris alpina were recorded without breeding features.

The role of mammalian predators and miofagial birds was insignificant due to their lower number. Destroyed by gulls or squas, eggs of Somateria spectabilis (shell from 2 eggs) were found on the Syargalakh-Belk'ey Island only. This was also confirmed by the observation of the brood of one here on July 31th.

Stercorarius parasiticus did not nest in this season because of low lemming density (after peak in 2000), but was present on Babaryna-Belk'ey Island and Syargalakh-Belk'ey Island. Another possible reason for the poor breeding season might be the cold spell in early June, when a dense snow cover remained after the birds had arrived in the breeding grounds.

#### 4.3.4 Reference

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## 4.4. Genetics Diversity, Phylogeography and Taxonomy of the Arctic Lemmings

*(N.I. Abramson)*

#### 4.4.1 Introduction

True or brown (Lemminae) and collared (Dicrostonychini) lemmings are the most common rodents of the recent tundra both in the Old and New World. They occupy a central place in the ecosystem of the tundra. During the so-called "lemming years", which occur every 4-5 years, the ground cover and vegetation are greatly influenced by their tunnels and food intake and eating habits. On the other hand, lemmings themselves provide food for predators like the Arctic fox, weasels, snowy owl, rough-legged buzzard and various species of skuas. However, until now researchers have not reached agreement about the number of lemming species, inhabiting the current tundra landscape, the limits of their ranges, the origin and relationship between species, little is known of their distribution history and whether their population follows the same or different cycles.

Concerning the taxonomy of brown lemmings (genus *Lemmus*) one of the issues that require clarification is the taxonomic status of lemmings from the Lena River delta (*terra typica* of *L. s. bungei*). As to collared lemmings (genus *Dicrostonyx*), any data on mtDNA structure from this region until now were also unavailable. One of the goals of the current project was to fill these gaps in the knowledge of the lemming biodiversity.

Latest studies, particularly with the use of molecular markers, showed that glacial cycles have impacted the evolutionary trajectories of many extant polar species. Studies performed on organisms found across the Holocene Arctic help to examine the importance of dispersal, vicariance and selection in shaping the distribution of arctic biota, particularly the importance of Pleistocene glacial cycles in influencing the population genetic differentiation and speciation. From this viewpoint both lemming genera represent an excellent model for this kind of study alongside with recent material an excellent fossil record from Late Pliocene to recent is available for both genera. In addition, to afore mentioned taxonomy questions the aim of this project also was to collect material for future analyses using DNA molecular markers to test the hypothesis on how isolation of lineages in separate glacial refugia during the late Pleistocene influenced the present patterns of genetic and morphological variation in collared and brown lemmings and whether these patterns coincide among different taxa.

### 4.4.2 Background studies

Recent studies on *Lemmus* taxonomy and zoogeography (Abramson, 1999a, b, Fredga et al., 1999, Fedorov et al., 1999) with application of molecular-genetic and morphological methods to one and the same material has revealed genetic separation of continental Paleocene Arctic populations of *L.sibiricus* into western and eastern groups with the boundary most likely to be along the Lena River. This separation was not reflected in lemming taxonomy, and recalled the subspecies *L.sibiricus bungei*, 1925, described from a small sample on the Lena River delta, which failed to receive recognition. Currently the main debate exists about the rank and status of the *bungei* race. Fredga et al. (1999) assign most importance to differences obtained by analyses of mtDNA and consider *bungei* to be a separate species. In our viewpoint morphological characteristics favor its status only as a subspecies, while making inferences directly from a quantitative evaluation of divergence obtained during sequencing separate fragments of mtDNA is bound to serious bias (Hendry et al., 2000). Anyway, because material from the Lena River delta directly was not studied with molecular markers, no clear answer can be given as to the status and precise western distribution border of *bungei*. Moreover, if we accept the hypothesis that the found split into western and eastern groups along the Lena River was caused by isolation in the past by the ice sheet (Fedorov et al., 1999) we may expect to find similar phylogeographic patterns in other species from this region and, if so, palaegeographic reconstruction will be more plausible.

### 4.4.3 Trapping of lemmings and collection of material in the field

Field work was carried out on Samoylov island from July 20 till August 2, 2001. Lemmings were caught with snap traps, which were set selectively for *Lemmus* and *Dicrostonyx*. The two types of lemmings occupy different habitats; *Lemmus* prefer wet lowlands with Carex, Eriophorum and mosses, *Dicrostonyx* prefer dry and sandy hills with short Salix species and dryas. At the site where the field work was carried out only two kinds of lemmings occur, there are no habitats suitable for voles. Most of the island constitute habitats more suitable for *Lemmus,* no wonder that it is more common than *Dicrostonyx* and easier to catch.

### 4.4.4 Preliminary results

In the previous summer season (2000) a peak number of both kinds of lemmings occurred in the region. The whole ground cover was dug by lemming pathways and holes. A lot of owl pellets and weasel's and Arctic fox excrements contained remains of lemmings with a predominance of *Lemmus.* Consequently, as it usually happens in a season following a peak, the number of lemmings was extremely low during the summer of 2001. The author managed to catch 7 brown lemmings and one collared lemming. The data on the age/sex composition of the lemmings caught are given in the table below. Proceeding from the state of the reproductive system and age of trapped brown lemmings we cannot say that we observed the depression stage in the lemming cycle, more likely it was a stage of decline as there were subadult individuals with embryos, a phenomenon typical for the population being at the stage of increase. Each individual trapped was weighed, measured, its reproductive status registered – testis size in males, number of fetuses and fetus scars in females, liver, kidney, heart and thigh muscle were taken and stored in absolute alcohol for future genetic studies.

In the laboratory of molecular systematics "Taxon" in the Zoological Institute RAS, St.Petersburg the total genomic DNA was extracted from liver tissues by overnight incubation at 37°C with proteinase K digestion in extraction buffer (10 mM TrisHCL, pH 8,0, 10 mM EDTA, 50 mM NaCL (phenol/ chloroform/ isoamylacohol, 25:24:1) followed by precipitations with 1/10 vol. 3M NaCl, 3x Polymerase chain reaction (PCR) was carried out with Robocycler in a volume of 25μl, containing 1 unit DNA polymerase, 0,7μl of primer, and 0.2 mM of dNTP.

### 4.4.5 Further Aspects

It is too early to give a definite answer to any issues listed above, but the quality of the electrophoretic gels is satisfactory, which means that the collection and storage of samples were successful. However, it is more likely that instead of the concept of Lena River delta as a demarcation line between species we would have to recognize a broad hybridization zone in this region.

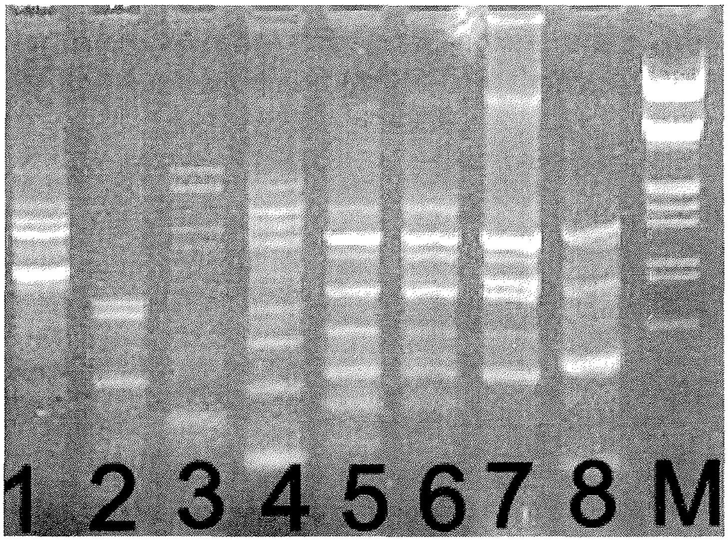


**Figure 4-1**: UP-PCR banding profiles, primer L45, numbers correspond to the lemming sampling according to the table1, M- marker

### 4.4.6 Acknowledgements

The author is extremely grateful to all German and Russian colleagues with whom I worked in the field on Samoylov island and is much indebted to a number of people, especially to Eva-Maria Pfeiffer, Dmitriy Bolshiyanov and others for making this project function. This project was partly supported by the grant 00-04-48849 of the Russian Foundation for Basic Research.

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# 5 Shore erosion processes and sediment flux from eroded islands in the apex of the Lena Delta

*(M. N. Grigoriev and W. Schneider)*

## 5.1 Introduction

Accumulation and erosion in the coastal zone and deltas are of major importance for the sediment budget of the Laptev Sea. Sediment balance within the Lena Delta is an open question still. The portion of sediment that is deposited in the Lena Delta and sediment flux from eroded delta's islands is not known. Admittedly, up-to-date sediment flux from the Lena Delta is some more than amount of accumulated deposits in that area.

One of goals of the coastal team was to conduct reconnoitering studies of shore retreat dynamics in the apex of the Lena Delta. In August 2001 27 key sites (Figure 5-1) which are characterized by active shore erosion were investigated in order to estimate a range of shore retreat and the amount of sediment income into the water due to shore erosion. Most studied sites belong to the islands composing the first terrace above flood-lands because the first terrace is a dominating geomorphological level in the studied area. Totally about 50 km of shore cliffs were studied in respect to the rate of erosion processes.

The first part of studies was to evaluate dynamics of only eroded shore sections. In 2001 we did not measure shore transformation in the accumulative or accretive shore sections. That will be our next step.

## 5.2 Methods

Methods of estimating the shore dynamics are simple in principle. Measurements of the distance between shoreline and some natural landmarks, which can be identified on an aerial photographs or big scale maps, have been carried out with a special tape-line. As natural landmarks mostly small lakes with stable shores were used. Mostly we measured a distance just to the edge of a cliff top excluding the width of the beach. They following analyses of remote sensing material were taken in past decades, and comparisons with our own up-to-date measurements allow us to calculate the average annual retreat rates of selected shores. Aerial photographs (scale 1:40.000 - 1:70.000), topographic maps (scale 1:25.000 -1:100.000) and satellite images were used during field works and office studies. Sediment flux coming from eroded shores was evaluated taking into account an average ice content and a specific density of the deposits composing the shore in the apex of the Lena Delta.

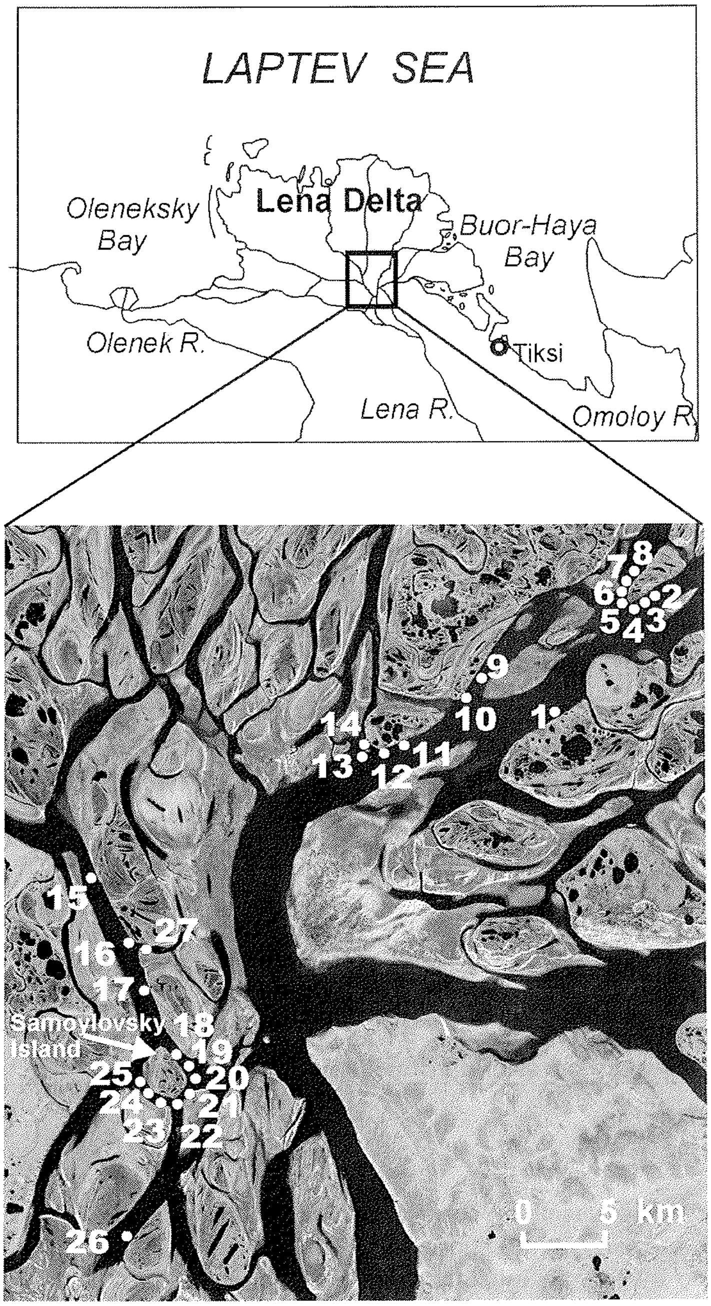


**Figure 5-1:** Key sites for the measurement of shore retreat rates in the Lena Delta Apex (see Table 5-1).

**Table 5-1:** Average retreat rates of actively eroded shores at the key sites in the apex of the Lena Delta.

| Key sites | Period of shore retreating | Land loss, m | Average retreat rate, m/yr |
|---|---|---|---|
| 1. Sardakh-Aryta Island | 1962-2001 | 187 | 4.8 |
| 2. Gogolevsky Island | 1972-2001 | 61 | 2.1 |
| 3. Gogolevsky Island | 1972-2001 | 55 | 1.9 |
| 4. Gogolevsky Island | 1972-2001 | 354 | 12.2 |
| 5. Gogolevsky Island | 1972-2001 | 412 | 14.2 |
| 6. Gogolevsky Island | 1972-2001 | 389 | 13.4 |
| 7. Gogolevsky Island | 1972-2001 | 131 | 4.5 |
| 8. Gogolevsky Island | 1972-2001 | 67 | 2.3 |
| 9. Trofimovsky Island | 1972-2001 | 244 | 8.4 |
| 10. Trofimovsky Island | 1972-2001 | 194 | 6.7 |
| 11. Baron Island | 1972-2001 | 267 | 9.2 |
| 12. Baron Island | 1972-2001 | 104 | 3.6 |
| 13. Small Baron Island | 1972-2001 | 157 | 5.4 |
| 14. Small Baron Island | 1972-2001 | 107 | 3.7 |
| 15. Matvey-Aryta Island | 1972-2001 | 136 | 4.7 |
| 16. Matvey-Aryta Island | 1972-2001 | 177 | 6.1 |
| 17. Yrbylakh-Aryta Ialand | 1972-2001 | 78 | 2.7 |
| 18. Samoylovsky Island | 1980-2001 | 29 | 1.4 |
| 19. Samoylovsky Island | 1980-2001 | 34 | 1.6 |
| 20. Samoylovsky Island | 1980-2001 | 61 | 2.9 |
| 21. Samoylovsky Island | 1980-2001 | 71 | 3.4 |
| 22. Samoylovsky Island | 1980-2001 | 40 | 1.9 |
| 23. Samoylovsky Island | 1980-2001 | 40 | 1.9 |
| 24. Samoylovsky Island | 1980-2001 | 32 | 1.5 |
| 25. Samoylovsky Island | 1998-2001 | 44 | 2.1 |
| 26. Sordokh-Aryta Island | 1972-2001 | 46 | 1.6 |
| 27. Matvey-Aryta Usland | 1972-2001 | 96 | 3.3 |
| **Average retreat rate of actively eroded coast** | | | **4.72** |

## 5.3 Results

The main the results of the shore retreat rate studies are placed in Table 5-1. All stations were fixed on the shore of the first terrace and flood-lands in the delta's apex. The average height of the cliffs is about 6 m (3-11 m). The average retreat rate of the actively eroded coast is about 4-5 m/yr. The shores located in front of current of the channels are being destroyed much faster: for example the stations 4-6 (Gogolevsky Island) and station 20-21 (Samoylovsky Island). The maximum retreat rate of the shoreline in the apex of the Lena Delta belongs to Gogolevsky Island (station 5, south-western cape), which divides the two largest channels: Trofimovsky and Sardakhsky. A comparison of the shoreline on aerial photograph of Samoilovsky Island taken in September 1980 with a shoreline taken from satellite image (July 2000) shows that there is a considerable modification of the margins of island for the last 20 years (Figure 5-2). At the same time, the western and northern shorelines on this picture are not so informative because in that case the contour of these low and flooded shores depends mainly on the river-water-level, which can change in wide range.

We cannot yet evaluate the volume of sediments from eroded shores for the whole delta. But such a sediment flux should be quite large. An estimation of sediment flux from studied eroded 50 km shores in the Delta Apex was based on the following parameters: average retreat rates – 4.7 m/yr; length of shoreline – 50 km; average cliff height – 6 m; average ice content – 20%; average specific density of deposits – 1,6 g/cm$^3$. In that way, we can calculate a sediment flux from studied sections:

4.7 m/yr (R) x 50 000 m (L) x 6 m (H) x 0,8 (Ice coefficient) x 1,6 t/m$^3$ (SD) =

**1.804.800 t/yr**.

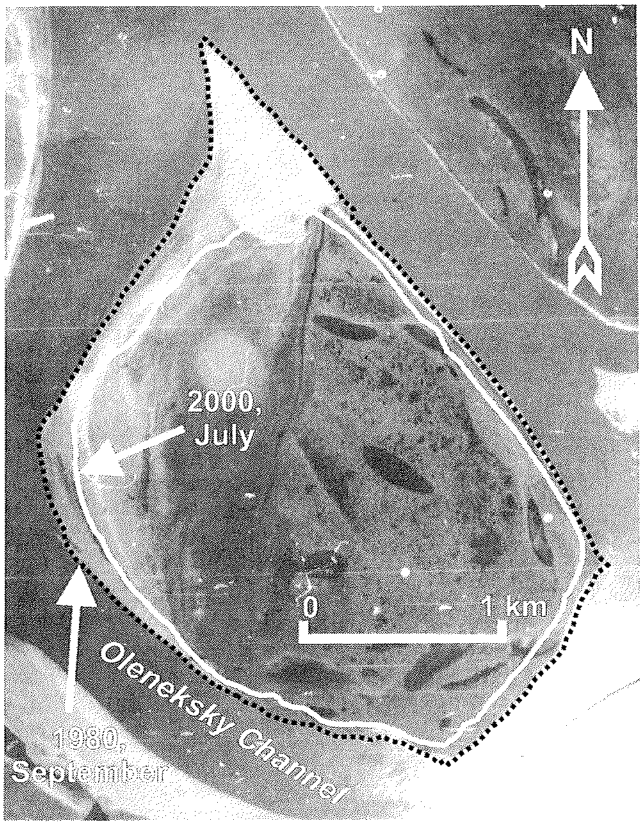


**Figure 5-2**: Aerial photograph of Samoilovsky Island (shoreline marked by dotted line) taken in September 1980 and shoreline position (white line) taken from satellite image in July 2000.

## 5.4 Discussion and conclusion

There is a number of problems concerning sediment balance of the Lena Delta: it is not yet known how much sediment is deposited inside the delta, on the surface of flood-lands, on the delta margins and within near-delta shallows; it is very difficult to estimate the sediment input from eroded sand banks, the volume of bed-load sediment discharge and the spring-flood sediment budget. Nevertheless, the fact that only local sections (50 km length) of the eroded delta's shore can supply about 1,8 m million tons of sediments per year, shows the great importance to erosion processes in the sediment balance of the delta.

We have studied only actively eroded cliffs in the area where water streams are characterized by fastest currents and the highest water levels. Evidently, it is impossible to disseminate obtained sediment flux parameters for the whole Lena Delta. But in any case preliminary studies give the ground to suggest that the sediment flux from eroded shores of the Lena Delta plays an important role in the sediment budget of the Laptev Sea.

# 6 Investigation of Run off in the Sardakh-Trofimovsky Bifurcation Point of the Lena River Delta, East Siberia, Russia, and related River Bed Deformations

*(D.Yu. Bolshiyanov, M.V. Tretiakov)*

## 6.1 Objective

One of the tasks of Russian-German expedition "Lena-2001" was the study of water and sediment runoff in second-order bifurcation points in the river's delta. However, it became obvious in the course of the study that one of the largest bifurcation points in the delta, Sardakh-Trofimovsky (72°36'N, 127°07'E), major attention should be paid to understand the river bed deformations and the runoff redistribution within the last decades.

## 6.2 Previous Research

Not much research work has been carried out in the Sardakh-Trofimovsky bifurcation point (STBP). In 1949, a navigation manual was written for Sardakh Channel of the Lena River delta. In this manual, of prime interest are the results of depth measurements made near the Sardakh-Khaya Island /0/. Though not accompanied by the data on water level, these results show generally small depths in the channel here (not more than 10-11 m) and give an idea of location of the channel's southern bank throughout the channel down to the sea.

Only in the 70s and the 80s the area was re-visited by scientists. These studies improved our understanding of water and sediment runoff redistribution in the STBP. They revealed a depth of as much as 27 meters near the same island. Hence, the channel must have notably increased its depth (from 10-11 to 27 m) within the period of 1949-late 1970s. This can be referred to the headwater erosion that followed the runoff redistribution in favour of Sardakh Channel. Yet in the reports /0, 0/ an active flow in Bolshaya Trofimovskaya Channel along the Bulgun'akhtakh-Aryyta island is mentioned. According to the data of Hydrographic Team of the Tiksi local division of Hydrometeorological Service of the USSR /0/, the runoff in Bolshaya Trofimovskaya Channel in summer low level period was as much as 43 – 52% of the total outflow in both channels. The measurements were carried out at the gauge line no. 5 (see Figure 6-1).

## 6.3 Measurements of 2001

We made a complex hydrometric study, depth measurements and river bed deformation assessment in the STBP within the framework of the "Lena-2001" scientific program. Flow speed, sediment concentration and depth were measured twice: on July, 29, at the termination of the flood wave, and on August, 22, at the high water period that followed the mid-summer season of low water. Flow speed measurements at selected hydrometric profiles and depth measurements at the profiles were accomplished as required by the

Russian Manual for Hydrometric Stations and Posts. The location of profiles, all distances and positions of the boat at velocity verticals were determined by theodolite and GPS. We made four gauge lines (see Figure 6-1). The main one (no.1) runs from the high erosional cliff of the Sardakh-Khaya Island to the sandy shallows Trofim Kumaga. The main flow of the river proceeds here. Profile no. 2 was made in Bolshaya Trofimovskaya Channel, which had played a greater role in the outflow of the Lena River than now. Formerly, this channel was very close to the Bulgun'akhtakh-Aryyta Island near the Trofimovsk settlement. The profile no. 3 is located in Bolshaya Trofimovskaya Channel and begins at Gogolevsky (former Bezymianny) Island. The purpose of the profile no. 4 was to account for the flow that goes eastward by Mastaakh-Uese Channel. The main income of water to the STBP by Bolshaya Trofimovskaya Channel after the junction of the current near the Stolb Island was calculated based on the dependence of discharge on the water levels observed at the observation site "Khabarovo" (formerly known as "Stolb" and "Sokol").

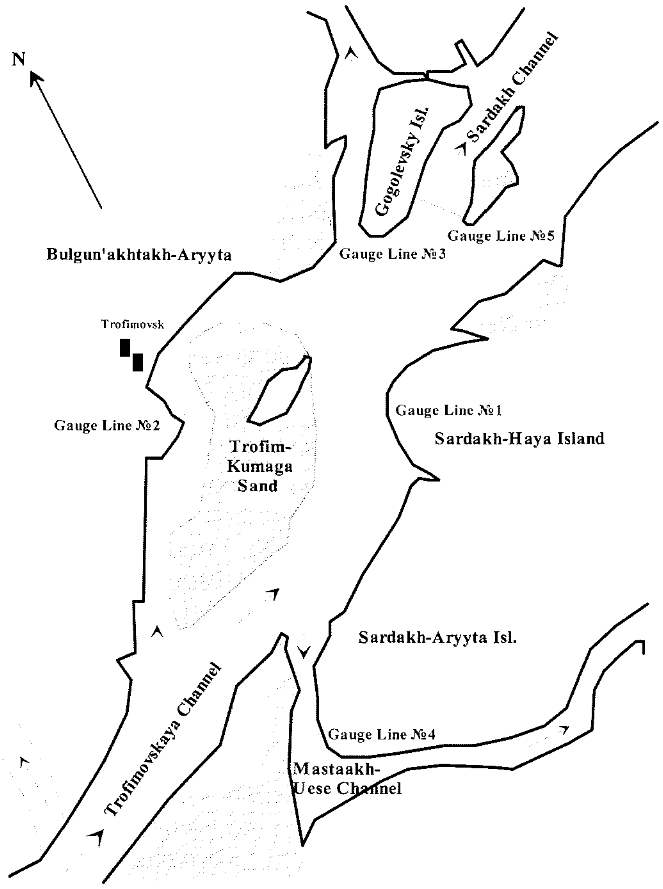


**Figure 6-1**: Situation map of Sardakh-Trofimovsky bifurcation point

Measurements at the gauge lines and along the beds of Bolshaya Trofimovskaya and Sardakh Channels were made with the sonic depth-finder. By these data, the bed of Sardakh Channel near the Sardakh-Khaya island (profile no. 1) has a pit-like (U-shaped) cross-section, depth up to 28 m. The bottom of the eastern half of the channel is a surface of bedrock covered by coarse-grained alluvium. Judging by the behavior of the anchor, while fixing the boat at the profile, sand must have been deposited in the western half. The bed of the Bolshaya Trofimovskaya Channel after its bifurcation from Sardakh Channel, at the upstream edge of the Gogolevsky island also is pit-shaped (U-shaped) but is worked out in earlier alluvium deposits.

Another set of measurements was carried out along the bed of Sardakh Channel downstream to the seaside. Unfortunately, the data on earlier measurements here were not accompanied by exact location of the measurement sites and water level marks, so that we cannot compare our data with those of previous studies. Nevertheless, obviously the southern bank of the channel is prone to intensive erosion that is definitely seen by the location of erosional cliffs on maps drawn decades ago compared to their contemporary location. Most clear evidence of erosion can be seen in former settlements, e.g., Bouor-Khaya in the Sardakh Channel mouth, where almost all buildings and cemeteries are ruined. The banks of the Sobo-Sise Island are vigorously eroded as well. In its cliffs the deposits of ice complex crop out.

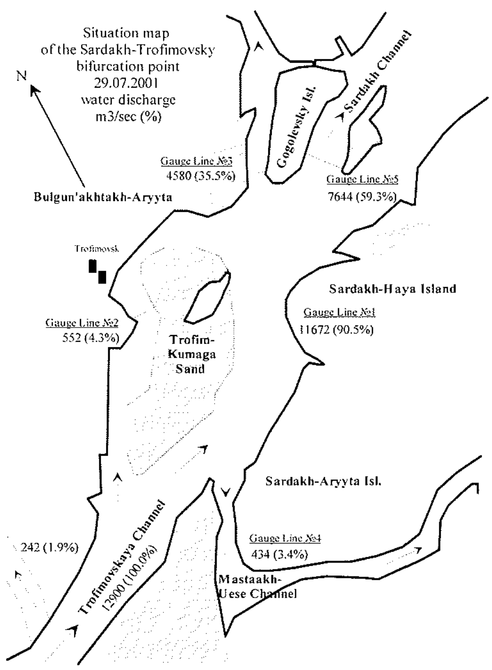


**Figure 6-2:** Situation map of Sardakh-Trofimovsky bifurcation point at 29.07.2001, water discharge $m^3$/sec (%)

Flow speed measurements and water discharge calculation on 29 July show that the sum of measured discharge rates differs by 1.9% (see Figure 6-2) from that in Bolshaya Trofimovskaya Channel calculated based on the relation between water level and discharge. This discrepancy may have arisen from measurement errors of water discharge and measurement error in determination of the said relation. Also, some small flow in almost closed channels north of the main bed of Bolshaya Trofimovskaya Channel (where it turns to the east) could have contributed to it.

The water discharge in Sardakh Channel at the gouge line no. 5 can be derived as

$Q_5=Q_1+Q_2-Q_3$,

where $Q_1$, $Q_2$, $Q_3$, $Q_5$ are the flows at the profiles nos. 1, 2, 3 and 5, correspondingly.

This calculation made it possible to plot the distribution of 29 July outflow in the STBP on a graph as shown at Figure 6-2.

The second survey (August, 22-23) focused on discharge rates at the gouge lines 3 and 4 only. For this reason, we cannot use in this case the relation applied for calculation of discharge at the gouge line no. 5 on July, 29. Nevertheless, assuming the discrepancy remains the same (1.9% of the discharge in Bolshaya Trofimovskaya Channel), the discharge at the gouge line no. 5 can be obtained as follows:

$Q_5=Q_{BTC}-Q_3-Q_4-\bullet$,

where $Q_{BTC}$, $Q_3$ and $Q_4$ are the discharge rates in Bolshaya Trofimovskaya Channel calculated based on the mentioned relation "level/ discharge" and at the gouge lines nos.3 and 4, correspondingly; $\bullet= 0.019\bullet Q_{BTC.}$ Figure 6-3 shows the discharge distribution in the STBP on 22nd and 23rd of August, 2001.

The observations and measurements of 2001 show considerable changes in runoff and river bed deformations in the STBP. Obtained discharge rates evidence for a decrease of the rate of Bolshaya Trofimovskaya Channel from 43-52% in the 80s to 37-40% now. Sardakh Channel has become deeper. It was being worked out throughout the entire period between the investigations (see Figure 6-4). The depth of its pit-shaped bed near the Sardakh-Khaya Island is as much as 28 m. Particularly spectacular are the changes compared to the data of 1948 /0/. The depth of the channel increased drastically from 10 to 28 m, and so did the width. Bolshaya Trofimovskaya Channel was navigable near the Bulgun'akhtakh-Aryyta island yet in the early 80s (with depth up to 4 m) /0/. Now it has completely degraded and represents a narrow stream with an average depth of 2-4 m and the rate of total flow of not more than 4,3%. The sand bed, called by locals Trofimovskiye Peski, or Trofim-Kumaga, has migrated downstream and formed large shallows in front of the Gogolevsky Island. The main flow now utilizes the Sardakh Channel. In addition, we observed that some small part of it runs from this channel to another one, Bykovskaya, by Mastakh-Uesya.

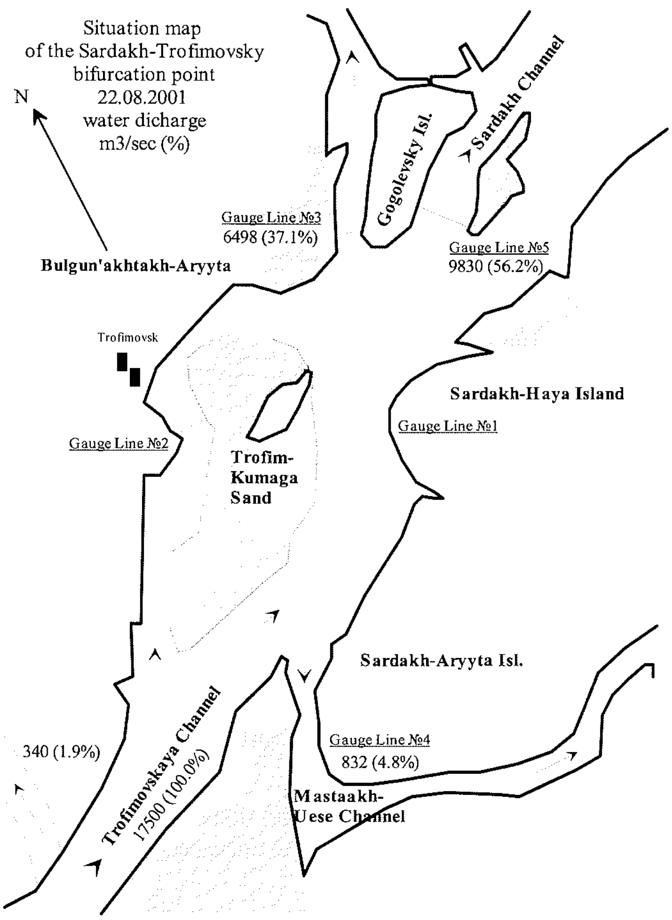


**Figure 6-3:** Situation map of Sardakh-Trofimovsky bifurcation point at 22.08.2001, water discharge m$^3$/sec (%)

Clear evidence of bank erosion can be seen throughout the entire Sardakh Channel. This also points to a more rapid flow than before.

## 6.4 Conclusions

The new data on erosion and runoff redistribution in the STBP show an increasing runoff southward and south-eastward in the Lena River delta. The reason for this phenomenon can be understood by analysis of a regional geographic map. Differentiated tectonic dislocations in this area occurring through Holocene have generally shifted the river flow to the east and then to the south. Previous investigations also did not exclude the tectonic origin of runoff redistribution /0,0/. At present, the delta is being most rapidly augmented in its south-eastern part.

Still, the main reason for the changes in the STBP is provided by river bed transformations. The catastrophic events in Sardakh Channel took place because of migration of the Trofim-Kumaga sand bed downstream and consequent plugging of the channel by sand. This led to formation of a narrow but deep erosional trench near the Sardakh-Khaya Island.

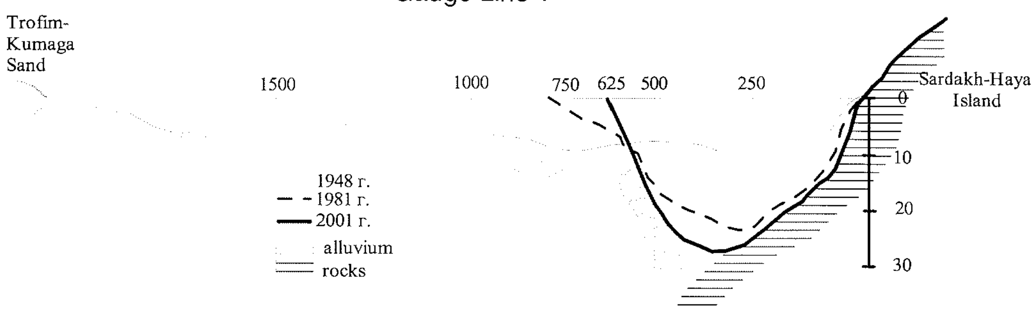


**Figure 6-4**: Dynamics of the Sardakh Channel

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# 7 Coastal processes and methane dynamics in the northwestern part of the Lena Delta

## 7.1 Introduction

*(M.N. Grigoriev, H.-W. Hubberten, L. Kutzbach)*

During the expedition LENA 2001 team 2 worked in the region of Babaryna Island/Sanga-Dzhie, which is located in the northwestern part of the Lena Delta (73°30-35'N, 123°10-30'E; Figure 7-1) from July 18 to August 3, 2001. The group consisted of three German and five Russian scientists of different disciplines, with two major objectives:

(1.) to investigate the very specific coastal erosion processes and shoreline dynamics in this area and

(2.) to acquire the first insights into the $CH_4$ dynamics of the wide landscapes of Arga Island.

The vast area of the Lena Delta of approximately 28.000km$^2$ is by no means uniform in its genesis and its ecological conditions, but can be subdivided geomorphologically into three major terraces plus various modern floodplain levels (Figure 3-2, page 23, Grigoriev 1993). The north-western sector of the delta, about 23 % of the total delta area, is covered by sediments of the second terrace. These sandy sediments build up several big islands, from which Arga Island is by far the largest with an area of 4800km$^2$. Arga Island is bounded by the Malaya-Tumatskaya branch in the east, the Tyobyulege branch in the south and the Laptev Sea in the north and west. It shows a very specific landscape structure, which differs substantially from the more western and southern parts of the delta and whose genesis is not definitively explained up to now (Schwamborn et al., 2002).

For the transportation of equipment and scientists to the field and back to Tiks, a helicopter MI-8 was used. The main camp, consisting of several small tents and a larger tent for cooking and work, was established on Babaryna Island, which lies about 2 km west to the coastline of Arga Island (Figure 7-1 and 7-9). A small lake located close to the camp served as a reservoir for drinking water.

The investigations of coastal processes were carried out at several key sites (Babaryna island, Sanga-Dzhie Cape, Babaryna-Tumsa Cape, Sargylakh Island, Channel of Sanga-Dzhie Lagoon, Barrier Islands). Shoreline profiles were measured from the Barrier Islands to the open Laptev Sea combined with sediment and suspension load sampling. In addition, submerged lake basins in the lagoon were studied. For the transportation to the sites, a rubber boat was used starting from the "New Harbor" at the east shore of Babaryna Island.

The studies concerning the $CH_4$ dynamics were conducted in the region Sanga-Dzhie, which is located on the mainland of Arga Island, close to the coast. This region was chosen as investigation site because it shows all the major landscape elements typical for the second terrace and was attainable from the main camp on Babaryna Island. An auxiliary camp was established at the border of the Lake Ochchugun-Nerpalakh (Figure 7-9, Figure 7-13), and the members of the "methane subgroup" travelled every morning by boat and on foot from Babaryna Island to their investigation site.

## 7.2 Pecularities of coastal processes and shoreline dynamics of the accumulative-erosive coastal system in the north-west of the Lena Delta

*(M. N. Grigoriev, F. E. Are, H.-W. Hubberten, S. O. Razumov and W. Schneider)*

### 7.2.1 Introduction

Accumulation and erosion in the coastal zone are of major importance for the modern and ancient sediment budget of the Laptev Sea. The amount of sediment transported by Siberian rivers is relatively well quantified. However, the portion of sediment that is supplied to the shelf from each type of erosive coast sections of the Laptev Sea is only insufficiently known. During the last decade the Laptev Sea coastline dynamics were investigated in detail at a number of erosion coastal sites, mainly along ice-rich coasts. In 1998-2000 coastal investigations were carried out at about 40 key sites in the western central and eastern parts of the Laptev Sea. Nevertheless, there are some gaps in respect to the evolution of the accumulation coastal forms and retreating erosion banks and sandy cliffs in the Lena Delta. Previous studies of northern erosion sandy coasts and eastern banks of the delta (Rachold and Grigoriev, 2000) have shown that the rate of retreat of such shores is quite high - up to several meters per year (average retreat rate is 1.5-2.5 m per year). Such rates are comparable with the rate of retreat of the eroded Laptev Sea coast consisting of an Ice Complex (Are, 1999; Grigoriev, Kunitsky, 2000). However, there was no reliable information about shoreline dynamics in the area where accumulation and erosion processes proceed jointly. Such a section, some 100 km long, which is characterized by active sedimentation in the near-shore zone, was selected on the west coast of the Lena Delta (Figure 7-1).

Preliminary investigations on this coastal section were undertaken in August 2000 (Are et al., 2001, Grigoriev et al., 2001). In July-August 2001, within the framework of the "Laptev Sea System 2000" project, the field studies of the chosen section have been conducted by the coastal team of the Russian-German expedition "Lena 2001". Seven key sites, including retreating erosion sandy shores with low ice content and accretion longshore sandbars (barrier islands), were investigated in order to define the long-term (about 30 years) rates of shoreline changes.

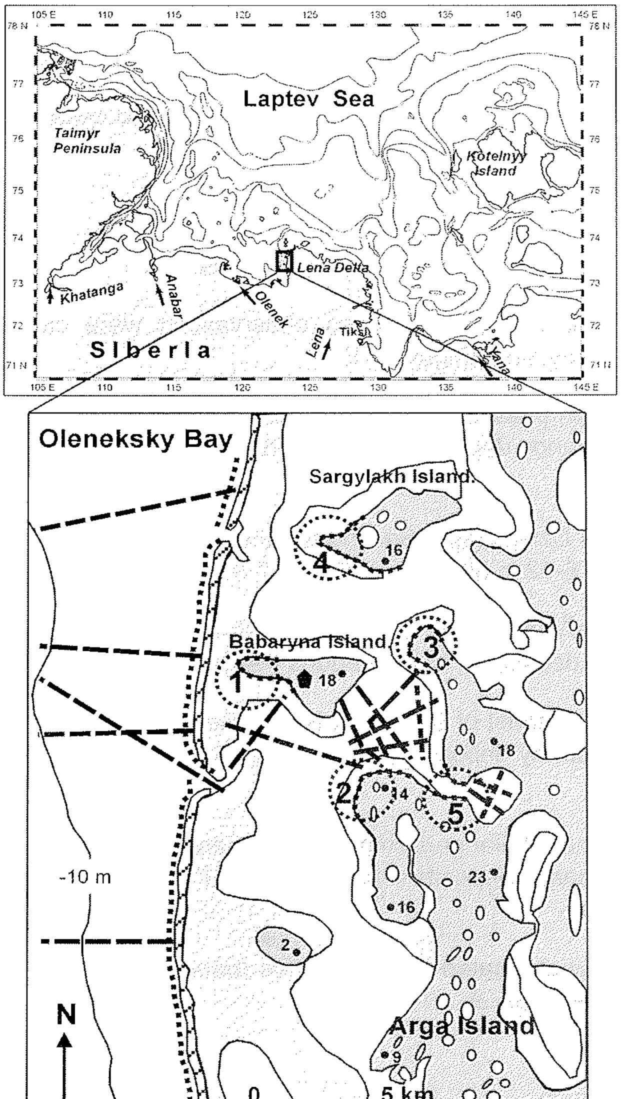


**Figure 7-1**: Studied "Babaryna" area, August, 2001: 1 – Barrier Islands (banks); 2 – Surface of the Second sandy terrace (Arga Islands, including small Islands-remnants); 3 – shallows; 4 – Bathymetric profiles; 5 – Up-to-date shoreline position measured by different methods at the key sites; 6 - absolute altitude; 7 – key sites for coastal erosion observations (1-Babaryna Island, 2-Sanga-Dzhie Cape, 3-

Babaryna-Tumsa Cape, 4-Sargylakh Island, 5-Channel of Sanga-Dzhie Lagoon); 8 - Camp

The main goal of investigations during the expedition "Lena 2001" was a quantitative evaluation of the main parameters of the coastal dynamics:

- retreat rates of erosive sandy cliffs of the second delta terrace including adjacent islands,
- motions of beach shoreline,
- displacements of banks and barrier islands.

In 2001 the field coastal processes observations were carried out in the following seven key sites (Figure 7-1):

Station 1: Western coast of Babaryna Island, Second terrace, late Pleistocene-Early Holocene sandy deposits with ice wedges ("Arga Complex"), 8-15 m high coast (Figure 7-2)

Station 2: Sanga-Dzhie Cape, Second terrace, late Pleistocene-Early Holocene sandy deposits, 8-12 m high coast (Figure 7-3)

Station 3: Babaryna-Tumsa Cape, Second terrace, late Pleistocene-Early Holocene sandy deposits with ice wedges ("Arga Complex"), 8-15 m high coast

Station 4: Western coast of Sargylakh Island, Second terrace, late Pleistocene-Early Holocene sandy deposits with ice wedges ("Arga Complex"), 7-13 m high coast

Station 5: Channel of Sanga-Dzhie Lagoon, Second terrace, late Pleistocene-Early Holocene sandy deposits with ice wedges ("Arga Complex"), 8-15 m high coast

Stations 6-7: Low elongated Barrier Islands (banks), recent silty-sandy marine sediments (see Figure7-2).

### 7.2.2 Methods

Geodetic measurements have been carried out at the key sites, using a laser theodolite Elta 50 R, to obtain the modern areal, horizontal and altitudinal position of the shores. Theodolite profiles and bench marks recorded in the field were identified and compared with the aerial photographs and maps. On erosional shores the position of the cliff base and the cliff upper edge was measured. On accretional shores the subject of measurements was the shoreline. Characteristic terrestrial features, which could be identified on aerial photographs as well, such as sharp turns of small streams, small water bodies, boundaries of different types of vegetation etc., served as natural marks.

About 30 aerial photographs (scale 1:50,000) and 10 topographic maps (scale 1:25,000-200,000) were analysed for the study of the north-western coast of the Lena Delta. The remote material was produced in 1969 and covers all key sites listed above. Theodolite profiles and bench marks recorded in the field could be identified in the remote material.

**Figure 7-2:** Theodolite survey of the Northern Cape of Babaryna Island and vast wind affected mud flat (barrier islands are on the remote edge of the flat), August, 2001.

**Figure 7-3:** Erosive cliff of the second sandy terrace, Sanga-Dzhie Cape, Arga Island, July, 2001

Furthermore, aerial photos and maps are used for long-term analyses of coastal dynamics of the key sites by computer techniques, which allow to estimate quite precisely an average rate of shoreline retreat and long-term trends of the Laptev Sea coast. Additionally, temperature profiles in the sea-lagoon water column were recorded at several stations. A thermal cable with temperature sensors and mercury thermometer were used for measurements of water temperature on a vertical water profile. Detailed information concerning general goals and methods of multi-stage coastal studies of the joint German-Russian expedition is presented in previous Reports of Polar Research (Rachold and Grigoriev, 1999, 2000, 2001).

### 7.2.3 Preliminary results

During field work a laser theodolite survey was the main method to determine erosion retreat and accretion rates of the coast. A geodetic survey of 35 km shores lines and cliff top edges has been carried out. The results of our geodetic survey and comparison with aerial photographs allow us to estimate average retreat rates of the coast and trends in the development of barrier islands (July, 1969 – July, August, 2001) at the key sites:

Station 1: Western coast of Babaryna Island – 0.5 m year$^{-1}$

Station 2: Sanga-Dzhie Cape - 0.9 m year$^{-1}$ (Figure 7-4)

Station 3: Babaryna-Tumsa Cape – 0.8 m year$^{-1}$

Station 4: Western coast of Sargylakh Islsnd – 0.7 m year$^{-1}$

Station 5: Channel of Sanga-Dzhie Lagoon – 0.3 m year$^{-1}$

Stations 6-7: Low elongated Barrier Islands (banks) - almost 0 m year$^{-1}$.

Preliminary analyses of our field data show that the rates of shore accretion and retreat are quite moderate in this area. The average rate of cliff retreat is 0.6 m year$^{-1}$ (0.2-1.5 m year$^{-1}$). The lowest rates of retreat refer to cliffs blocked by vast shallows, whereas the highest rates refer to sites adjacent to a relatively deep shoreface. We expected to discover a considerable motion of barrier islands towards the land but only marginal parts of barrier islands show a distinct movement to the land. Sandbars are very low and have long accumulative forms, blocking almost the whole western coast of the Delta. Displacements of the crest of the long and narrow barrier islands were measured in both offshore and onshore directions as large as 2.5 m/year during 32 years in several sections. But these islands remain relatively stable. On the whole, the investigated area represents a complicated erosive-accumulative coastal system dominated by shoreline motions towards the land (Figure 7-5).

Sand sediments of the second terrace belong to the Late Pleistocene-Holocene epoch and contain small ice wedges. The average ice content of ground ice is about 20%. The surface of the second terrace of the Delta is rich in large and deep lakes. Widespread deep lagoons were formed during Late Holocene due to shore erosion and penetration of the see water into the lakes. The morphology of the lagoons completely corresponds to contours and depths of the typical large lakes. The cliffs and surface in near-shore zones are very poor in vegetation due to permanent wind erosion. Sometimes it is not so easy to understand what is more important for the retreat rates of the cliffs in this area: sea erosion or wind erosion, because so much fine sand sediments are reworked by strong wind. As usual, the foot of a cliff is characterized by a very wide beach, which is flooded by sea water from time to time.

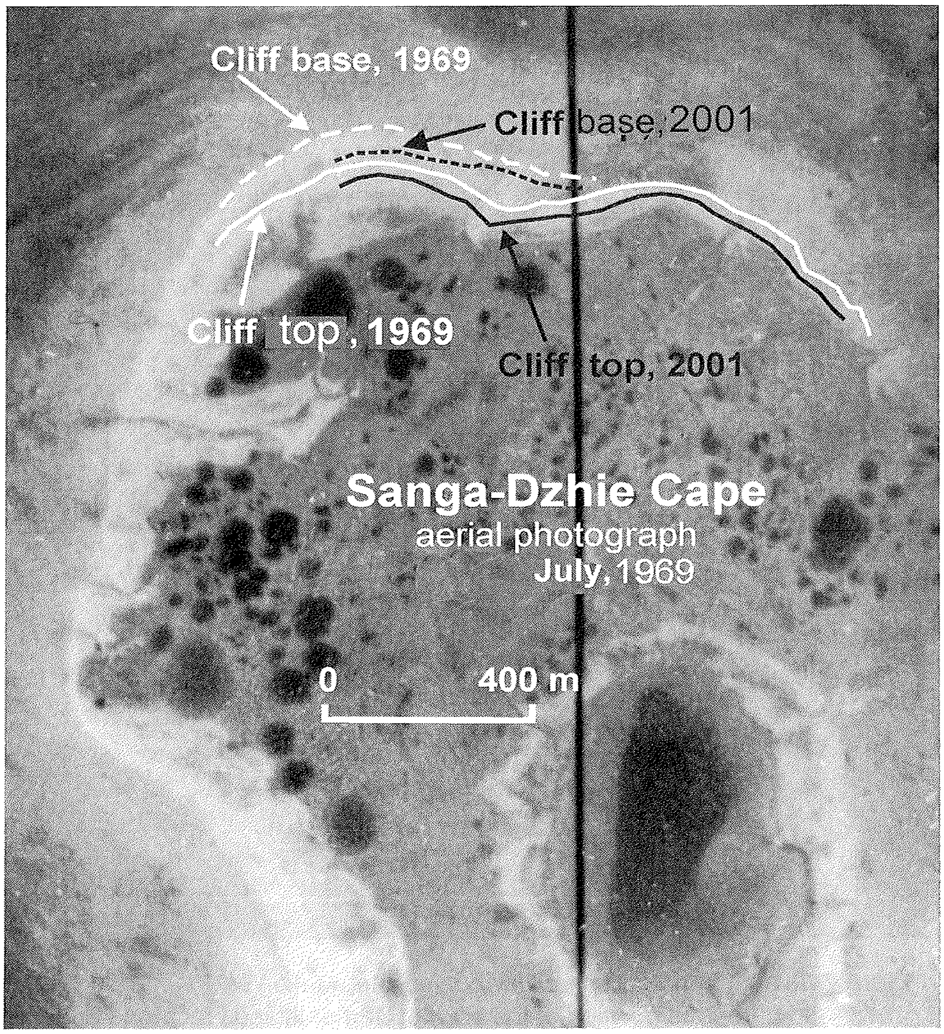


**Figure 7-4:** Aerial photograph of Sanga-Dzhie Cape (Arga Island) taken in June 1969 and the up-to-date position of the cliff top and cliff base recorded in July 2001.

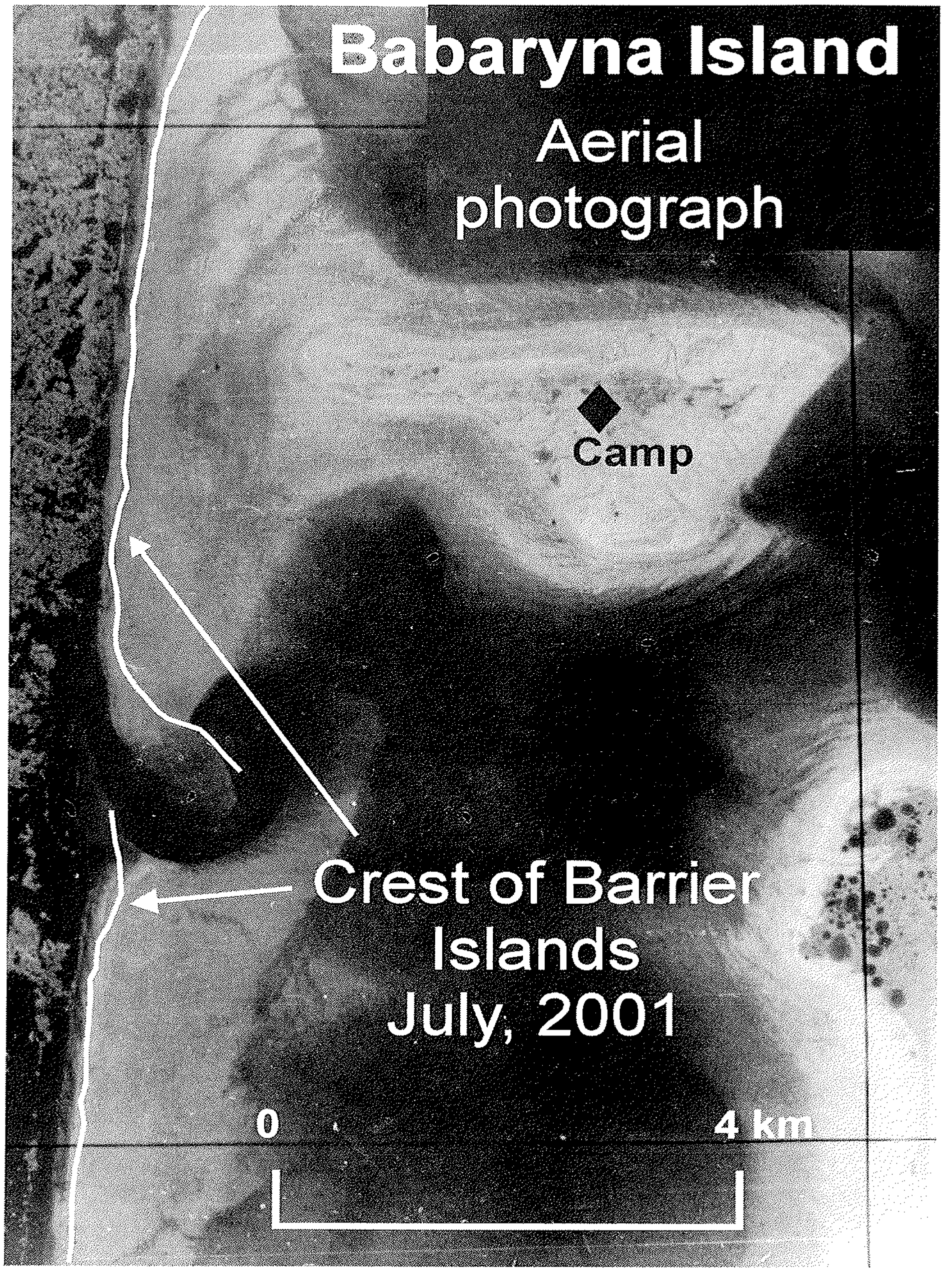


**Figure 7-5:** Aerial photograph of "Babaryna" area taken in June 1969 and the up-to-date position of the crest of Barrier Islands recorded in August 2001.

## 7.3 Bathymetric measurements

*(F.E. Are, M.N. Grigoriev, H.-W. Hubberten, S.O.Rasumov and W. Schneider)*

### 7.3.1 Introduction

The field work of the coastal group was concerned with the west coast of Arga-Muora-Sise Island in the Lena River delta (Arga for brevity). A very complicated coastal system unique for the Eurasia Arctic divides land and sea in this area. It plays an important role in the sediment budget of the adjacent Laptev Sea.

About 100 km of the Arga Island west coast is built up of a vast 10-20 m high sand plain with a large number of deep thermokarst lakes. The lake bottoms are situated below sea level. The submergence of these lakes during the last marine transgression has created an extremely embayed coast divided from the sea by a 4-7 km wide lagoon (Figure 7-6). The lagoon is separated from the sea by a chain of long-shore sand bars (barrier islands) about 1 m high. Some parts of these bars are composed of quicksand. Emerged shoals and shallows occupy at least 50% of the lagoon area. The emerged shoals and barrier islands undergo regular flooding. Some remnants of the coastal plain are preserved in the lagoon in the shape of islands as high as 18 m. The geomorphology of the area testifies that the coasts are profoundly altered by coastal erosion in the past (Are and Reimnitz, 2000). Apparently wind surges in Olenek Bay as high as 1.9-2.3 m (Ashik at al., 1999) are a strong driving force of coastal erosion. The area of Babaryna Island (Figure 7-6) was chosen as a key section for the field investigations.

The goals of the bathymetric measurements consisted in the study of geomorphology and bottom sediments of the

(1) Barrier islands shoreface and

(2) Submerged lake basins in the lagoon.

### 7.3.2 Methods

Bathimetryc measurements were carried out by a portable echosounder, installed on a motor boat. The measurements of depth and distance from the starting point were implemented with a 10-second interval. The boat speed was set in a way to get the distance measurement step of about 10 m. The results of the measurements were put into computer in cm for depth, and in metres for distances. The sea floor profile and the boat route could be observed during measurements on a computer display. A grab sampler was used to take bottom sediment samples.

### 7.3.3 Preliminary results

(1) *Barrier island shoreface*

Three shoreface profiles were measured (2, 3, and 4 in Figure 7-6). Two profiles (1, and 5), were taken in 1999 from a bathymetric map of 1:100 000 scale, based on data from 1968. Our measurements started from the shore and were carried out until 10 m depth and backward. The sediment sampling was carried out along the back route with 2-m depth interval.

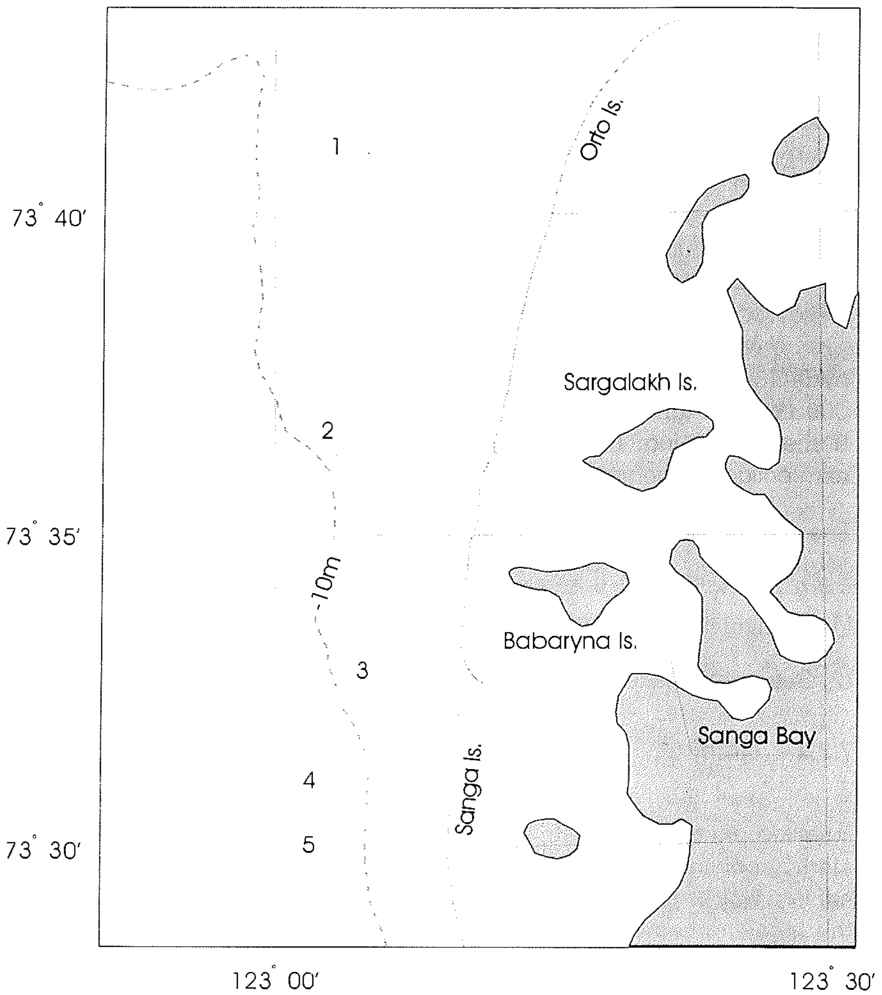


**Figure 7-6:** Field measurement area. 1-5 – shoreface profile locations and directions.

The geodetic measurements of barrier island position and comparison with topomaps and aerial photographs did not show any considerable displacements during the last 20 (?) years. This means that the modern shape of the shoreface corresponds with the state of the ultimate dynamic equilibrium.

The 10-m isobath shown on the topomaps recedes from the coast in northern direction. The channels connecting the lagoon with the sea turn to the north near their mouth (Figure 7-6). Both these features and existence of longshore bars (Figure 7-7) testify that sediment transport occurs in the northern direction. Accordingly, the slope of the upper part of measured shoreface profiles diminishes in northern direction (Figure 7-7).

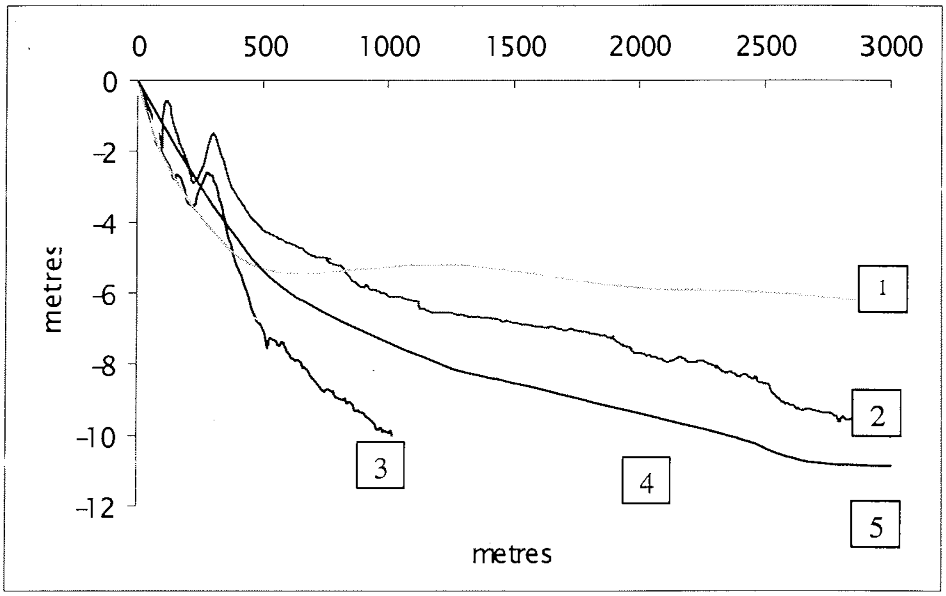


**Figure 7-7:** West coast shoreface profiles of Arga Island

The existence of sediment transport along the stable shore puts a question on the sediment source. Thereby the large disagreements in 10 m isobath position on the measured profiles and on the topomap turn attention (Table 7-1). These disagreements suggest intensive shoreface erosion during the last 15-20 years. For the present it is a preliminary conclusion, because only a topomap was used for comparison. The measured profiles should be compared with more accurate bathymetric maps. Profile 5 in Figure 7-6 is taken from a navigation map, but this profile is located 2.1 km south from profile 4.

**Table 7-1:** Distance between the shore and 10 m isobath.

| Profile | | Distance between the shore and 10 m isobath, m | |
|---|---|---|---|
| No. in Fig. 7-7 | Name | Measured with echosounder | On the 1:200 000 scale topographic map published in 1987 |
| 2 | Sardalakh | 3000 | 4800 |
| 3 | Babaryna | 1000 | 4100 |
| 4 | Sanga | 2000 | 2400 |
| 5 | Sanga | - | 2350*) |

*) This distance is measured on a navigation map of 1:100 000 scale based on 1968 data.

Kluev measurements (1967, 1970) support indirectly the possibility of shoreface erosion. According to Kluev data 2 and 4 m isobaths along a section of Anabar-Olenyok coast 157 km long moved onshore for 0.5-1.2 km within 20 years from 1942 till 1962. The shore retreated only 80-100 m during the same time.

Mathematical approximation of the measured shoreface profiles is being planned to compare their shape with the shape of similar erosional profiles in the middle and low latitudes. As an example a preliminary approximation of the Babaryna profile is shown in Figure 7-8. The widely used power function $\boldsymbol{h = A \cdot x^m}$ (Bruun, 1954) and

exponential function $\boldsymbol{h = B(1 - e^{-kx})}$ proposed by Bodge (1992)

were applied for approximation. In these expressions $\boldsymbol{h}$ is the depth, $\boldsymbol{x}$ is the distance from the shore, and other parameters are empirical coefficients. Coefficient $\boldsymbol{A}$ reflects the sediment grain size, and $\boldsymbol{m}$ corresponds with the mode of wave energy dissipation along the shoreface.

Looking at Figure 7-8, the fit curve deviations from the measured profile are caused largely by the presence of a 2-m high longshore bar. The values of the coefficient of determination $\boldsymbol{R^2}$ testify that the exponential function fits the Babaryna profile somewhat better than the power function does. Outside of the Arctic, according to Bruun (1954) and Dean (1977), the mean value $\boldsymbol{m}$ equals 0.67 $m^{1/3}$, and $\boldsymbol{A}$ along the sandy shores varies in the range 0.06 – 0.2. Thus, the value of hydrodynamic coefficient $\boldsymbol{m}$ for the Babaryna profile is somewhat higher than its mean value outside the Arctic, and the parameter $\boldsymbol{A}$ outsteps the limits for sandy shores.

The bathymetric measurements in the mouth of the channel, connecting the lagoon with the sea south from Babaryna Island, have revealed prevailing depth within the range 3-4 m.

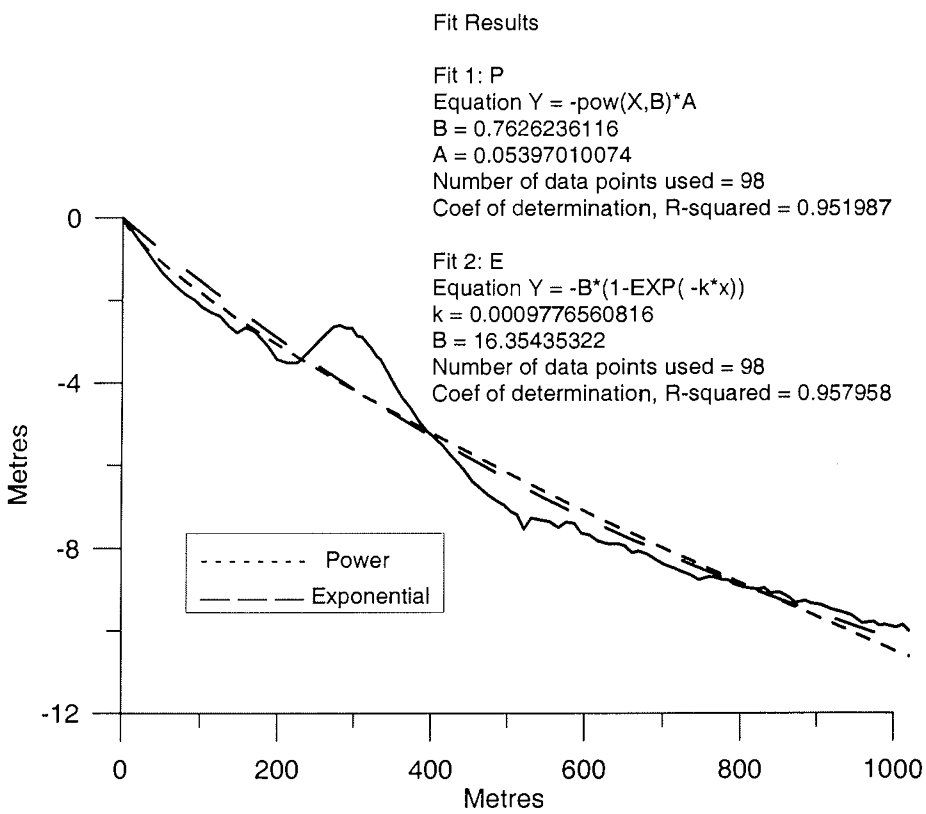


**Figure 7-8**: Babaryna profile (No. 3 in Figure 7-6) with fit curves of two kinds

## 7.4 Methane-related investigations of soils and waters in the Sanga-Dzhie region

*(L. Kutzbach and A. Kurchatova)*

### 7.4.1 Objectives

One of the main aims of our studies on modern processes in permafrost-affected landscapes is to evaluate the $CH_4$ budget of the Lena Delta on a regional scale. Up to now, studies on $CH_4$ dynamics were conducted only in the central part of the Lena Delta, on the island Samoylov and its surroundings, where the third terrace, the first terrace, and the modern floodplain levels could be investigated (e.g. Pfeiffer et al., 1999). However, information about $CH_4$ dynamics in the landscapes of the second terrace, which cover nearly one fourth of the area of the Lena Delta, was absolutely lacking. Major questions were:

Are the landscapes of the second terrace sources or sinks of $CH_4$?

Which soil types occur on the sandy sediments of the second terrace, and are their properties favourable to $CH_4$ production?

What is the impact of the different water bodies of the second terrace, especially the large and deep thermoerosional lakes, on the $CH_4$ budget of these landscapes?

### 7.4.2 Working plan and methods

a) The landscape of Sanga-Dzhie was described carefully with regard to topography, soils, vegetation, thaw depth, lake occurrence, and $CH_4$ emission during short inspection tours.

b) Representative investigation sites were chosen for the significant landscape elements (Figure 7-9). Four sites were located on low rises: Site SDS1 at the summit surface of a rise, Site SDS2 at the slope shoulder of a rise, Site SDS3 at a low deflation section on a slope, and Site SDS4 at a coastal cliff. At site SDS1 four sub-sites (a...d) were investigated. Another two sites were located in a deep thermoerosional lake (Ochchugun-Nerpalakh Lake, Figure 7-9, Figure 7-13): Site ONL1 at the vegetated and shallow lake rim, Site ONL2 in the deep lake centre. The geographic position of sites, investigations conducted in the field, type of samples, and planned analyses in the laboratory are listed in Table A7-3. A detailed sample list is provided in Table A7-4.

c) Sites were investigated in terms of $CH_4$ emission and the controlling ecological factors by different biogeochemical methods depending on the ecosystem type. For the characterisation of soils, reference pits were dug. Soils were described and classified according to the eighth edition of the Soil

Taxonomy (Soil Survey Staff 1998) and the 4th edition of the German field book for describing soils "Bodenkundliche Kartieranleitung" (AG Boden 1994). Air-dried soil samples as well as cooled moist samples were taken to investigate soil chemistry and soil microbiology, respectively. At site SDS4, samples of permafrost sediments were taken additionally for radio-carbon dating and pollen analysis. Lakes were characterised by sampling the water column and the underlying lake sediments. The water column was sampled at regular depth intervals to determine water temperature, pH, electric conductivity, concentrations of anions and cations, and content of dissolved $CH_4$. Three sediment cores were taken by a small gravity corer to analyse sediment chemistry, sediment micromorphology, and the methanogenic microbial community.

$CH_4$ emission was determined by a closed chamber technique as described by Pfeiffer et al. (1999) with slight modifications for different purposes. For determining $CH_4$ emissions from soils, PVC chambers were set on PVC frames, which were inserted into the soil, thus closing the headspace. For determining $CH_4$ emissions from lakes, floating chambers were used. Headspace samples were preserved by injecting them into glass tubes filled with saturated sodium chloride solution and sealed with rubber stoppers and twisted caps. The saturated sodium chloride solution prevented microbial activity and solution processes of gases. Samples were analysed after 10 days by gas chromatography in the field laboratory on Samoylov Island.

### 7.4.3 Description of the landscape of Sanga-Dzhie with regard to $CH_4$ dynamics

The landscape of Sanga-Dzhie is characterized by undulating rises with gentle slopes and maximal elevations of 25 m. The rises are pervaded by narrow erosion channels and alternate with wide depressions, in which extensive and deep thermoerosional lakes are situated. Regarding the potential for $CH_4$ emission, three significant landscape elements can be recognised:

1. level to gently inclined summit surfaces of the rises,
2. steeper sloped surfaces at the shoulders and backslopes of the rises,
3. deep and large thermoerosional lakes in the depressions.

(1.) On the summits of the rises, surfaces are only very gently inclined (< 3 %). Frost cracks, ice wedges and low-centred rectangular polygons are developed, but the polygonal microrelief is weakly pronounced compared to the younger surfaces of the modern delta (Figure 7-10, Figure 7-11). The main frost cracks and correspondingly the polygons are aligned parallel to the contour lines of the rises giving the slopes a complex, step-like shape. Because the uplifted rims of the polygons are orientated across the slope gradient, water cannot drain freely downhill and accumulates in the polygon centres. In most of the polygon centres, the water level is below the soil surface, but in others there is water standing above the soil surface, or even polygonal mires have developed. In the areas with the least inclination, shallow thermokarst mires with depths of 0,5 m and diameters up to 30 m are common. Where the water level is below the soil surface, vegetation is dominated by sedges (e.g. *Carex aquatilis, Eriophorum scheuchzeri*) and mosses (e.g. *Oncophorus wahlenbergii, Andreaea rupestris*) with minor shares of lichens and dwarf shrubs. Where the water level is above the soil surface, vegetation consists almost solely of sedges and hydrophytic grasses (e.g. *Carex aquatilis, Arctophila fulva, Dupontia fisheri*). The hydrological conditions as described above suggest soil properties favourable for methanogenic microorganisms. Site SDS1 (sub-sites a...d) represents this landscape unit.

(2.) On the shoulders and backslopes of the rises, surfaces are more steeply inclined (5...8 %) than on the summits. No ice-wedges are developed, but non-sorted nets with cell diameters of about 0,5 m are characteristic (Figure 7-12). The cells of the net are outlined by polygonal cracks, but also weak signs of cryostatic soil mixture and outflow of mud can be seen on the surface. The vegetation is obviously different from that on the rise summits. It is sparse and consists mainly of lichens (e.g. *Ochrolechia frigida*) and dwarf shrubs (e.g. *Cassiope tetragona, Salix nummularia*) showing dry soil conditions. The drier hydrological conditions suggest soil properties which are not optimal for methanogenesis. Site SDS2 represents this landscape unit.

(3.) Along the watershed of Arga Island, numerous large and deep thermoerosional lakes have developed, which show a characteristic shape and a specific bathymetry (Schwamborn et al. 2002). They are elliptical, prolonged, and their long axes are regularly orientated approximately in North-South direction. In the central part of these lakes, deep lake basins are located with water depths in the range of 10 to 30 m. These deep basins are surrounded by extensive shallow rims with water depths of less than 2 m. From the shallow rims to the deep basins, the lake bottom drops down abruptly with a very steep slope. Beneath the lake basins, profound taliks (unfrozen sections of ground within permafrost) with depths of up to 100 m are formed (Schwamborn et al. 2002). Investigating $CH_4$ dynamics in permafrost landscapes, the deep lakes of Arga Island are of particular interest because it is suspected that $CH_4$ produced and stored in deeper layers of permafrost or even thermogenic $CH_4$ could be released to the atmosphere via the taliks beneath these lakes. One of these lakes was studied during our expedition: the Lake Ochchugun-Nerpalakh (Figure 7-13), which is located closely to the coast and was best attainable from our main camp on Babaryna-Belkee Island (Figure 7-9). With a length of 3 km and an area of 3,6 km$^2$, Lake Ochchugun-Nerpalakh is one of the smaller deep thermoerosional lakes of Arga Island. Sites ONL1 and ONL2 represent this lake.

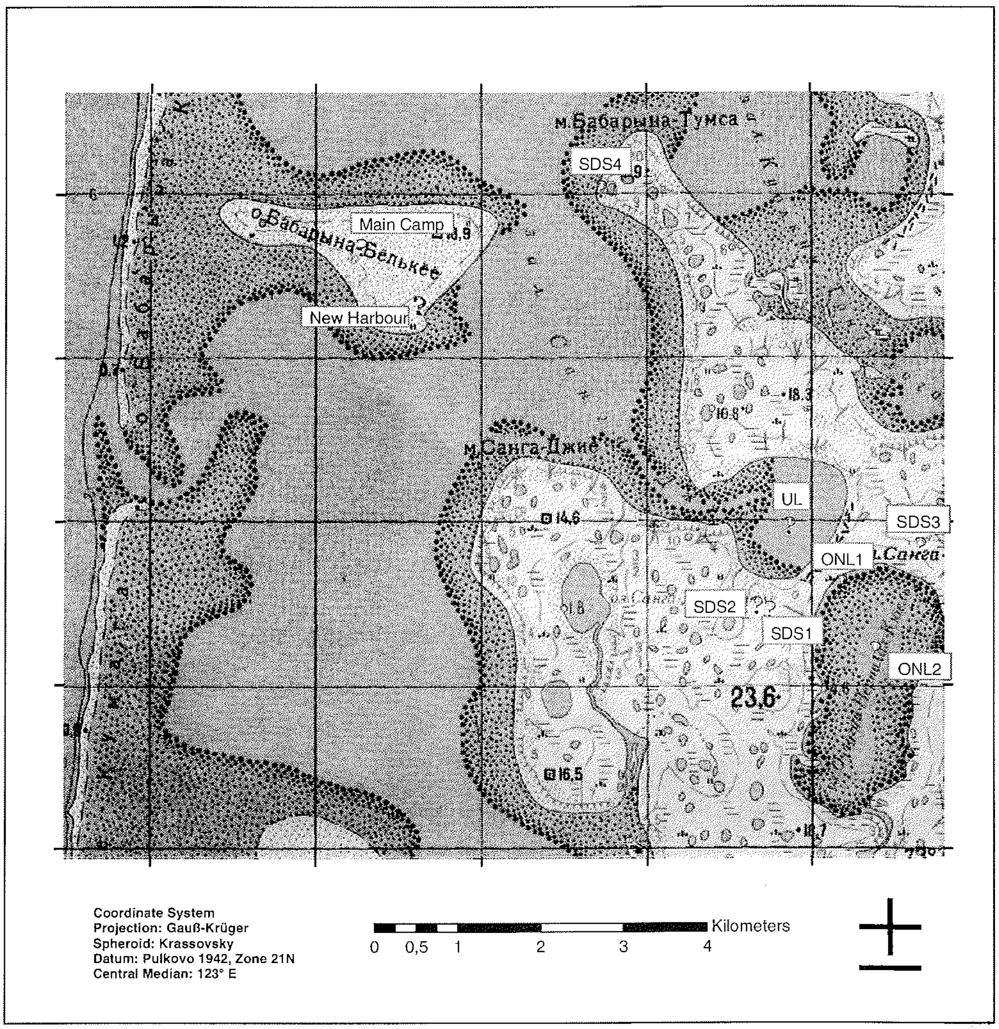


**Figure 7-9:** Map of the region Sanga-Dzhie / Babaryna-Belkee with investigation sites. Geographic position of sites, investigations conducted in the field, type of samples, and planned analyses in the laboratory are listed in Table A7-3.

**Figure 7-10:** The tundra of Sanga-Dzhie viewed from helicopter; the orthogonal network of frost cracks can be seen.

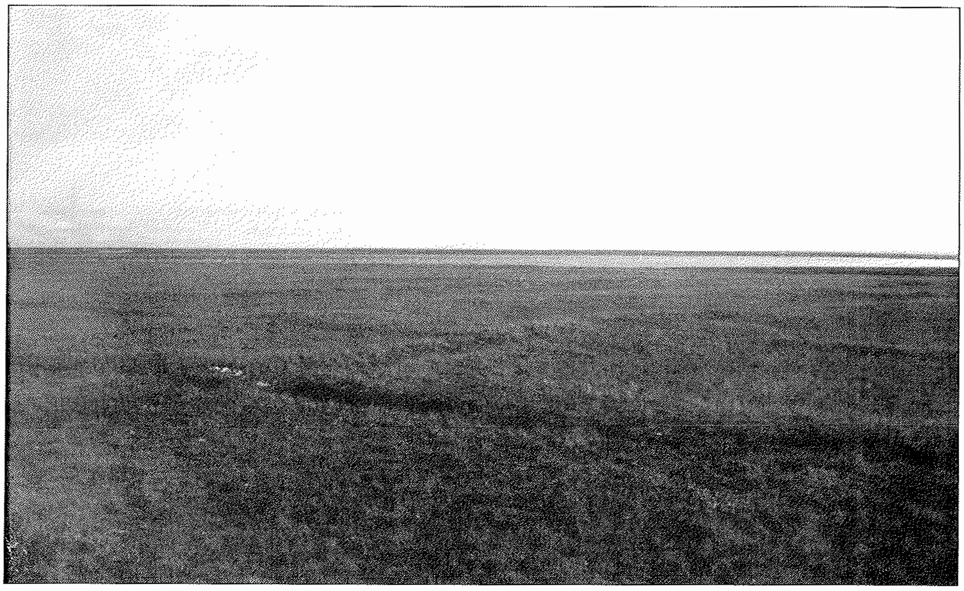

**Figure 7-11:** Typical tundra surface on the summits of the rises in the Sanga-Dzhie region. A pattern of rectangular ice-wedge polygons can be observed, but the microrelief is only weakly pronounced. In the background, Lake Ochchugun-Nerpalakh can be seen.

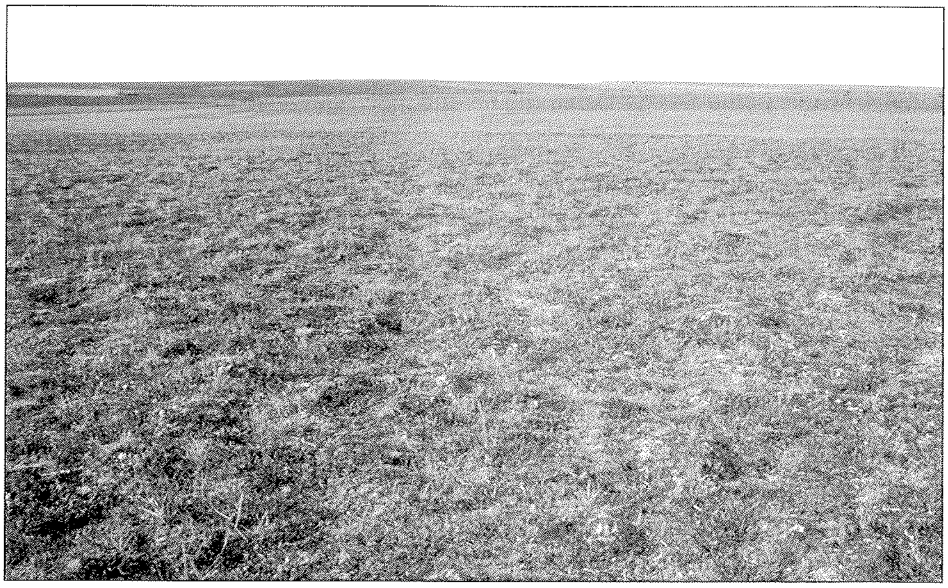

**Figure 7-12:** Typical tundra surface on the steeper slopes of the rises in the Sanga-Dzhie region. Non-sorted nets with cell diameters of about 0,5 m are characteristic.

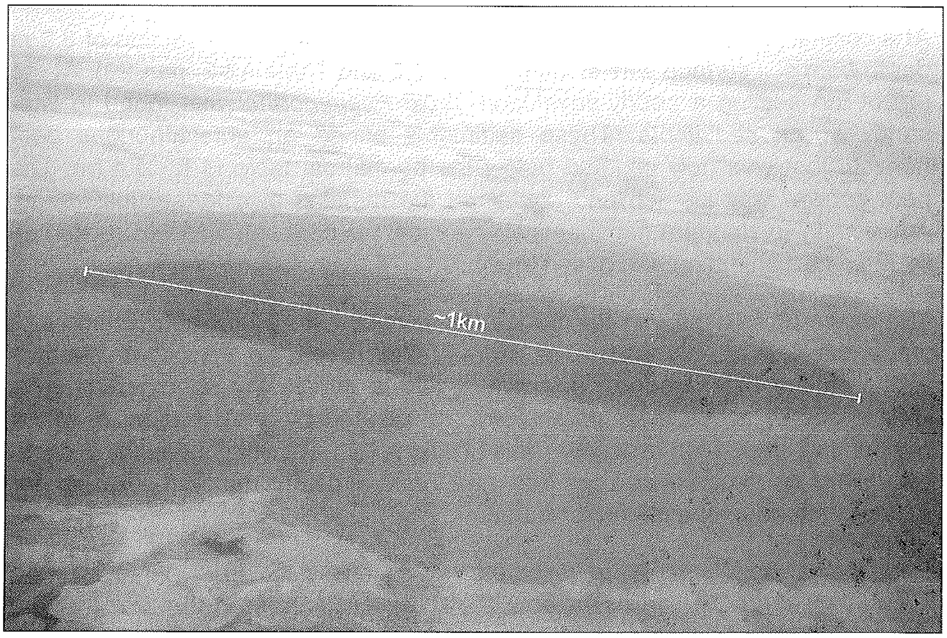


**Figure 7-13:** The northern part of Lake Ochchugun-Nerpalakh, one of the smaller typical deep and large thermoerosional lakes of Arga Island – view toward east north east from helicopter.

### 7.4.4 First Results

7.4.4.1 Soils of the Sanga-Dzhie region and their relevance to $CH_4$ dynamics

All investigated soils had in common a fine-sandy parent material and more or less strong marks of cryoturbation. Thus, they all were classified as *Turbels*. However, they differed clearly with regard to water balance and content of organic matter due to the diversified relief of Sanga-Dzhie. On the weakly inclined summit surfaces (site SDS1), *Typic Histoturbels* were found (Table A3-2 part 27). Here, water could not drain freely, so that soils were moist to wet, and organic material was accumulated forming peat horizons. Cryoturbation marks were observed, but only to a minor degree. At steeper slopes (site SDS2), where drainage was more intense, *Psammentic Aquiturbels* were found (Table A3-2, part 26). These soils were dry in the upper soil but showed gleyic characteristics in the lower soil. Organic content in these soils was low, and no histic horizons had developed. Marks of cryoturbation were prominent. These soils were influenced both by frost-creeping and cryostatic mixing. At a deflation cliff (site SDS3), a *Typic Psammoturbel* was described (Table A3-2, part 28; Figure 7-14). This soil was well drained and had a very low organic content. A former soil surface was buried by recent aeolian sedimentation of fine sands. Ice-wedges were thawed to a depth of 1.2 m. The position of the former ice-wedge could be recognised by a band of intensive iron oxide accumulation (pseudomorphosis), which was noted as cryoturbation.

At a coastal cliff at Cape Babaryna-Tumsa (Site SDS4), a cliff section of 3.2 m depth from soil surface was studied (Table 7-2 and Table A3-2, part 29). At the top of the section a poorly-developed *Typic Psammorthel* was found in fine-sandy eolian sediments. These sediments buried an autochthonous peat horizon, that was now situated below the permafrost table (1.6 - 1,4 m). The peat horizon was ice-rich and contained the remains of a former ice-wedge. Additionally to standard geochemical analyses, the peat samples will be studied by radio-carbon dating and pollen analysis.

The active layer depths in the Sanga-Dzhie region were between 35 and 120 cm at the end of July 2001. The large melting depth on the second terrace unlike on the other geomorphological levels is due to the sandy sediments. Differences of active layer parameters are caused by site location, moisture regime and vegetation characteristics (Table A7-2). The minimal melting depth was found in the center of a polygon, and maximal depth was discovered on the sandy slope ridge of a lake depression.

Hydrological conditions were reflected in $CH_4$ emissions from particular soils (Table 7-3). The $CH_4$ emission from the *Typic Histoturbel* at the moist tundra site (SDS1a) was moderately high with $25.32 \pm 7.1$ mg $m^{-2}$ $d^{-1}$. At a wet, swampy tundra site (SDS1b, 5 m distant from site SDS1a), the $CH_4$ emission amounted to $63{,}8 \pm 17{,}8$ mg $m^{-2}$ $d^{-1}$.

In contrast, the $CH_4$ emission from the *Psammentic Aquiturbel* at the drier site SDS2 was very low with $0.4 \pm 0.3$ mg $m^{-2}$ $d^{-1}$.

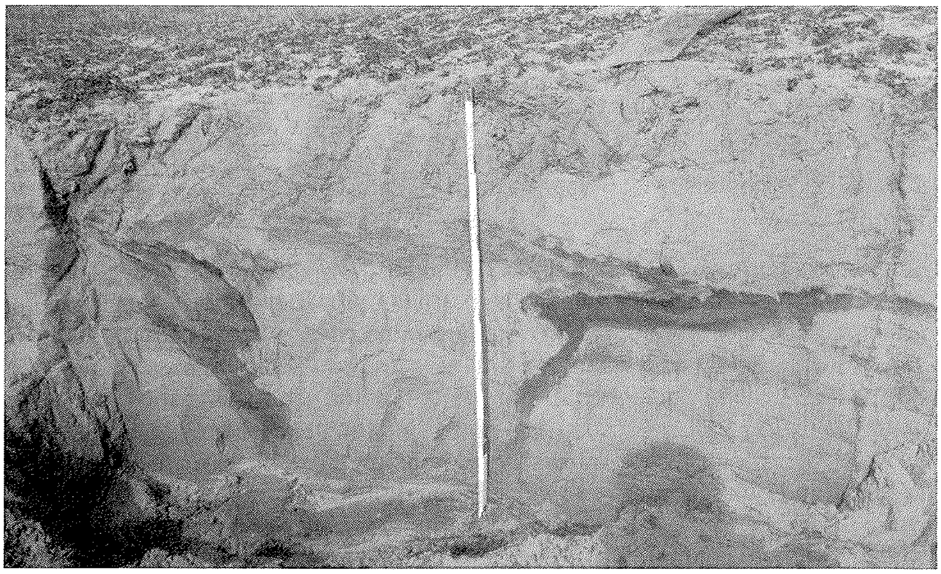

**Figure 7-14:** Soil profile of *Typic Psammoturbel* at a deflation cliff at a slope of a rise, Sanga-Dzhie (Site SDS3).

**Table 7-2:** Description of coastal cliff section at Cape Babaryna-Tumsa, site SDS4

| | |
|---|---|
| *Date* | 2.08.01 |
| *Location* | Arga N 73°34,51′; E 123°21,82′ |
| *Elevation* | 8 m a.s.l. |
| *Soil type* | *Typic Psammorthel* (poorly-developed) |

| Depth, *m* | Description |
|---|---|
| 0-0,3 | fine sands, density: <1, organic content: 1-2%, weakly rooted (5-10%). |
| 0,3-0,9 | alternation of peat and sandy layers (1-2 cm), density: 3, organic content: 5-10%, very weakly rooted (2-5%) |
| 0,9-1,6 | the same horizon, but frozen, massive structure, close to young ice vein, ice and organic content are increased (10%) |
| 1,6-1,7 | autochthon slightly decomposed moss peat with fine sands, organic content: >30% |

| | |
|---|---|
| 1,7-1,9 | alternation of sandy peat and fine sands, organic content: 15-30% |
| 1,9-2,4 | deformed layer of sandy peat with high ice content, organic content: 15-30% |
| 2,4-3,2 | grey fine sands with 30% of iron-oxide spots, old ice wedge, organic content 0,5-1% |

### 7.4.4.2 Hydrochemistry and $CH_4$ emission of different waterbodies of Sanga-Dzhie

The large thermoerosional Lake Ochchugun-Nerpalakh was well-mixed by strong winds at the time of investigation. Values of pH, electric conductivity and water temperature were very homogenous in the whole water column (Figure 7-15). pH was slightly acid with 6.3 ± 0.04. Electric conductivity was very low with 83.3 ± 0.26 µS $cm^{-1}$ indicating a low nutrient status. The $CH_4$ content was low with 0.77 ± 0,13 µg $L^{-1}$ between 1 m and 11 m depth. Only directly at the water surface, $CH_4$ content was slightly higher ranging from 4,12 µg $L^{-1}$ at 0,5 m depth to 98,64 µg $L^{-1}$ at 0,1 m depth suggesting an uptake of atmospheric $CH_4$ via the water surface (Figure 7-16). Lacustrine deposits were composed of fine sands with low organic content. The cores (30cm) could be divided into three horizons: the lower part – grey gley sand, a transitional horizon – greyish-orange sediment, and the upper part of the core – rusty organic sandy silt. Cold water enriched by dissolved oxygen caused oxidation of the upper lacustrine sediments and evidently leads to the accumulation of iron oxide.

On the whole, $CH_4$ emission from Lake Ochchugun-Nerpalakh was low (Table 7-3): In the deep centre (site ONL2), no emission was observed (Table 7-3, Figure 7-17). Only at the narrow vegetated rims (site ONL1), a low emission rate of 8,7 ± 4,6 mg $m^{-2}$ $d^{-1}$ could be measured.

The water of a small thermokarst lake (ø 15 m, depth 0,5 m) at Site SDS1 was medium acid (pH: 5,81) and had a low electric conductivity of 113,7 µS $cm^{-1}$. $CH_4$ emission was high with 44,8 ± 7,7 mg $m^{-2}$ $d^{-1}$ at a vegetated site (SDS1c). At an unvegetated site (SDS1d), $CH_4$ emission was much lower with 4,0 ± 3,1 mg $m^{-2}$ $d^{-1}$ (Table 7-3).

**Table 7-3:** $CH_4$ emission from different landscape elements of Sanga-Dzhie, each 3 parallels.

| Site | Description | Date | $CH_4$ flux (mg $m^{-2}$ $d^{-1}$) |
|---|---|---|---|
| SDS1a | moist tundra, *Typic Histoturbel* | 26.07.01 | 25,32 ± 7,1 |
| SDS1b | wet, swampy tundra | 24.07.01 | 63,8 ± 17,8 |
| SDS1c | small thermokarst mire vegetated | 26.07.01 | 44,8 ± 7,7 |
| SDS1d | small thermokarst mire unvegetated | 25.07.01 | 4,0 ± 3,1 |
| SDS2 | dry tundra, *Psammentic Aquiturbel* | 29.07.01 | 0,4 ± 0,3 |
| SDS3 | dry tundra, deflation cliff, Typic Psammoturbel | - | - |
| ONL1 | large thermokarst lake, vegetated rim, 0,2 m water depth | 23.07.01 | 8,7 ± 4,6 |
| ONL2 | large thermokarst lake, unvegetated centre, 11m water depth | 27.07.01 | 0,1 ± 0,01 |

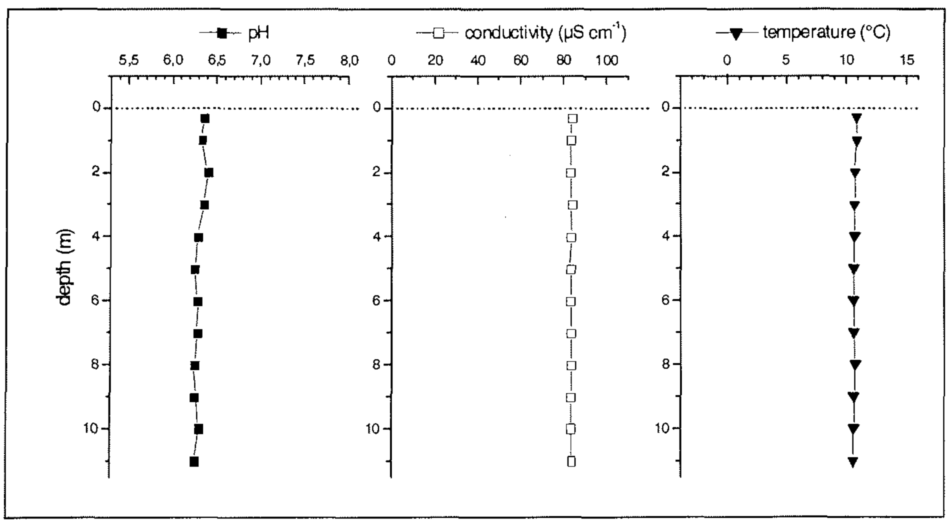


**Figure 7-15:** pH, electric conductivity and water temperature plotted against water depth, Lake Ochugun-Nerpalakh (Site ONL2), 25 July 2001.

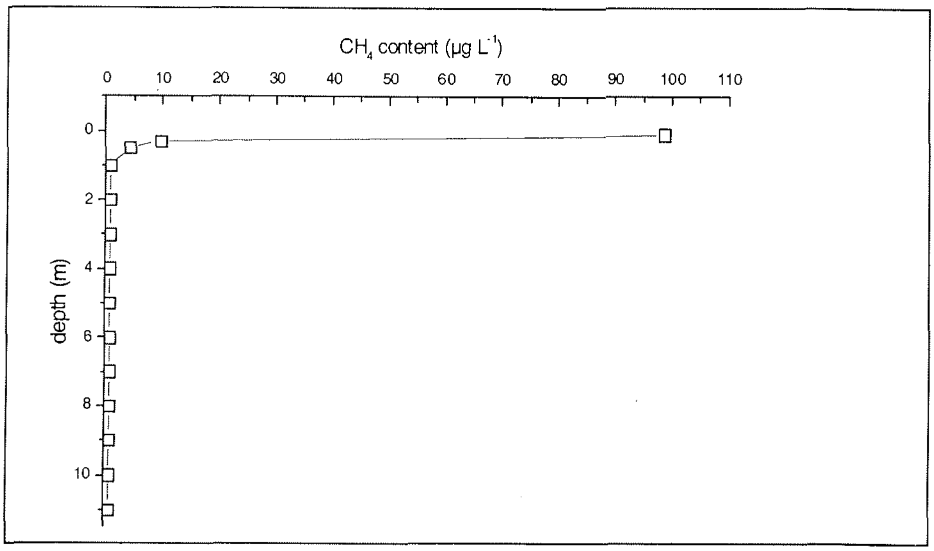


**Figure 7-16:** $CH_4$ content plotted against water depth, Lake Ochchugun-Nerpalakh (Site ONL2), 25 July 2001.

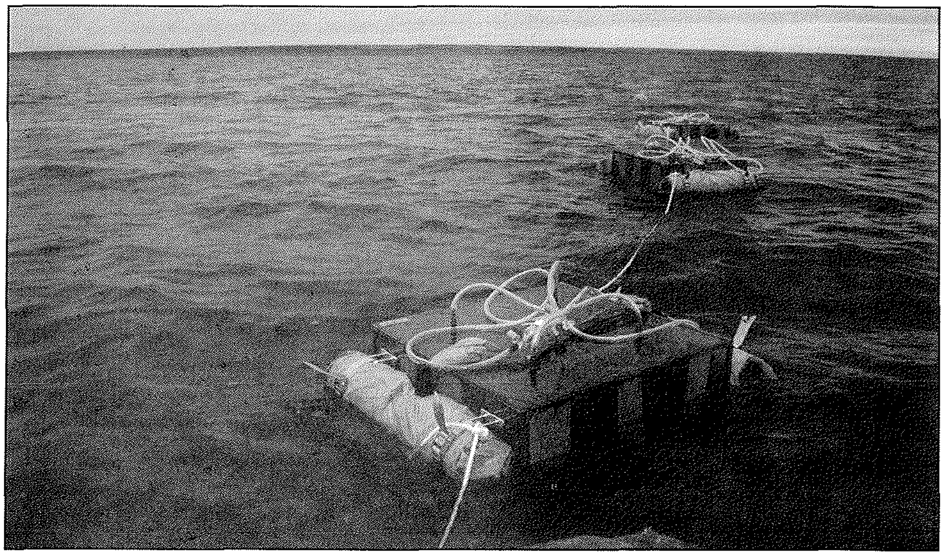

**Figure 7-17:** Measurement of $CH_4$ emissions in the centre of the Lake Ochchugun-Nerpalakh (Site ONL2) on 27 July 2001. $CH_4$ emission rate was calculated from the change of $CH_4$ concentration inside the floating chambers over a time span of 24 hours: No $CH_4$ emission was observed!

### 7.4.5 Conclusions and prospects

The conducted investigations show clearly that the landscapes of the second terrace are relevant sources of $CH_4$ and have to be considered in $CH_4$ emission assessments on the regional scale. Large parts of the landscape are characterised by poor drainage. Moist to wet soils with histic properties and shallow thermokarst mires are common providing favourable conditions to methanogenic microorganisms. Consequently, $CH_4$ emission rates are high, in the same magnitude as reported from the central Lena Delta. Only at steep slopes, dry soils are situated with low or no $CH_4$ emission. The interesting pattern of soil and vegetation types, which depends on relief position and controls spatial variability of $CH_4$ emission, should be investigated more intensively in the future.

The assumption that the large and deep thermoerosional lakes of the second terrace are major sources of biogenic or even thermogenic $CH_4$ could not be verified. Our studies suggest that these nutrient-poor lakes are no sources of $CH_4$ but rather sinks of atmospheric $CH_4$. This unexpected result should be rechecked in the future by investigating a second lake of this type over longer time periods.

The sediments of the second terrace were described in literature as extremely organic-poor, thus complicating age determination. In the region Sanga-Dzhie, buried peat horizons could be observed at several shore cliffs in frozen sediments. The investigation of these horizons by radio-carbon dating and pollen analysis will probably give new insights in to the puzzling landscape history of the second terrace.

## 7.5 Bathymetry and biogeochemistry of "Sanga-Dzhie Lagoon" and "Sanga Lake Lagoon" at the western coast of Arga Island

### 7.5.1 Objectives

The coast of Arga Island is subject to intense erosion processes (cf. Chapter 7.2). Due to these processes, several large and deep thermoerosional lakes, which are close to the coastline, have gained direct contact to the sea and have been transformed into brackish lagoons. These lagoons are obviously very specific ecosystems with an interesting genesis and biogeochemistry. We examined two lagoons, the Sanga-Dzhie Lagoon south-west of Babaryna Island, and the Sanga-Lake Lagoon close to Ochchugun-Nerpalakh Lake. The second lagoon was called "Ugly Laguna" in the field (Site UL, Figure 7-7, Table A7-3, Figure 7-18), because a substantial outgassing of hydrogen sulfide could be observed by intense smell.

Our goal was to characterise the bathymetry and biogeochemistry of these lagoons as specific landscape elements of the transition zone between marine and terrestrial permafrost geosystems.

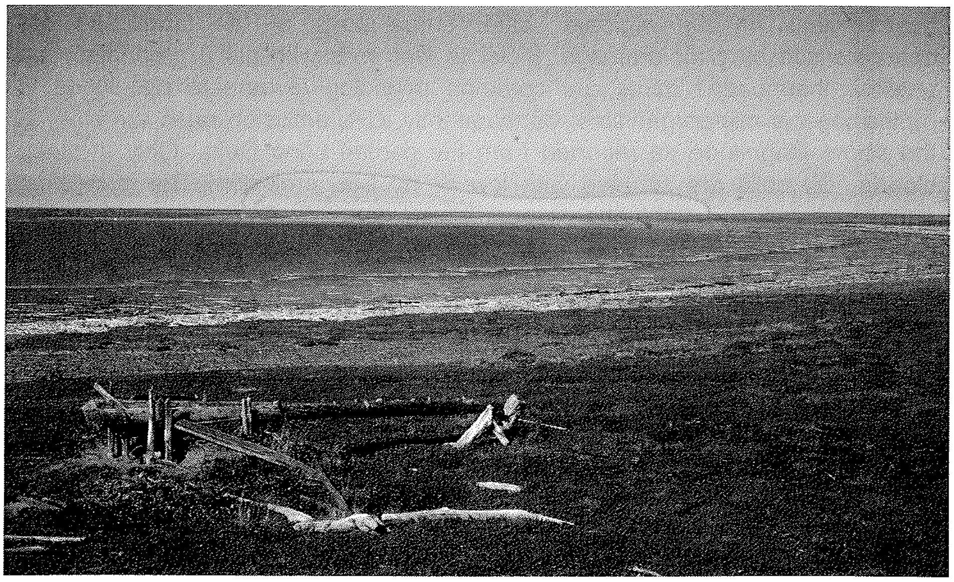

**Figure 7-18:** The eastern part of Sanga-Lake Lagoon, Site UL.

### 7.5.2 Methods

Bathymetry: For the study of the underwater topography of the lagoons, depth profiles were taken using a portable echosounder fixed to the rubber boat. Depth and travel time were recorded every 10 seconds, and the obtained data were transferred to a computer for later processing.

Temperature measurements: Temperature profiles in the water column of the lagoons were recorded at several stations. A thermal cable with temperature sensors and a mercury thermometer were used for the measurements of water temperature on a vertical water profile. Additionally, three temperature data loggers were fixed at depths of 1.0, 8.5 and 10.3 m in the Sanga-Lake lagoon for the time period July 21 to August 1.

The biogeochemistry of the lagoon was investigated by sampling the water column and the underlying sediments. The water column was sampled at regular depth intervals to determine water temperature, pH, electric conductivity, concentrations of anions and cations, and content of dissolved $CH_4$. Three sediment cores were taken by a small gravity corer to analyse sediment chemistry, sediment micromorphology and the community of methanogenic and sulfate-reducing microorganisms. A detailed sample list is provided in Table A7-4.

### 7.5.3 First results

Bathymetry: The bathymetric profiles were processed and plotted as depth counter maps and threedimensional underwater topographic pictures (Figure 7-19). From this figure, the former elongated structure of the typical Arga lakes is obvious and explains the formation of these lagoons from flooding of older lakes due to coastal erosion. A similar picture was obtained for the Sanga-Dzhie lagoon, which reaches a maximum depth of about 20 m.

Sediments cores of the Sanga-Lake lagoon were 50 cm in depth and were characterised by black colour, a high content of organic matter, and a strong smell of hydrogen sulfide (sample ID LD01 8211-8213).

Profiles of water temperature, pH, electric conductivity and dissolved $CH_4$ showed a very stable stratification of the lagoon at the time of investigation (Figure 7-20, Figure 7-21).

The pH value was neutral to weakly basic. Electric conductivity was in the upper part of the water column about 12 mS $cm^{-1}$ and increased with depth to 95 mS $cm^{-1}$. The heavier saline water was at the bottom, and the freshwater stayed on top with only weak mixing.

The temperature profiles recorded in both lagoons are shown in Table A7-1. The most interesting observation was made in the deepest part of Sanga-Lake lagoon where a layer of positive temperatures occurred, probably due to bacterial activity in the uppermost layers of the bottom sediments. The temperatures recorded over the time of 10 days in Sanga-Lake lagoon showed a gradual increase from 6 to 14°C at 1 m depth and a constant temperature for the two lower loggers of – 2.3°C.

The content of dissolved $CH_4$ was very high in the deep part of the water column with up to 7,7 mg $L^{-1}$. In this lagoon high concentrations of $CH_4$ and hydrogen sulfide exist in parallel. This is surprising because in marine environments the production of hydrogen sulfide by sulfate-reducing microorganisms typically inhibits the production of $CH_4$ in great quantities. The question comes up, whether the observed high $CH_4$ content was produced only recently in the lagoon sediments or is released from deeper permafrost or talik sediments. Laboratory experiments will be conducted to investigate if methanogenic microorganisms can be active under these very special conditions of the lagoons of the Sanga-Dzhie / Babaryna-Belkee region.

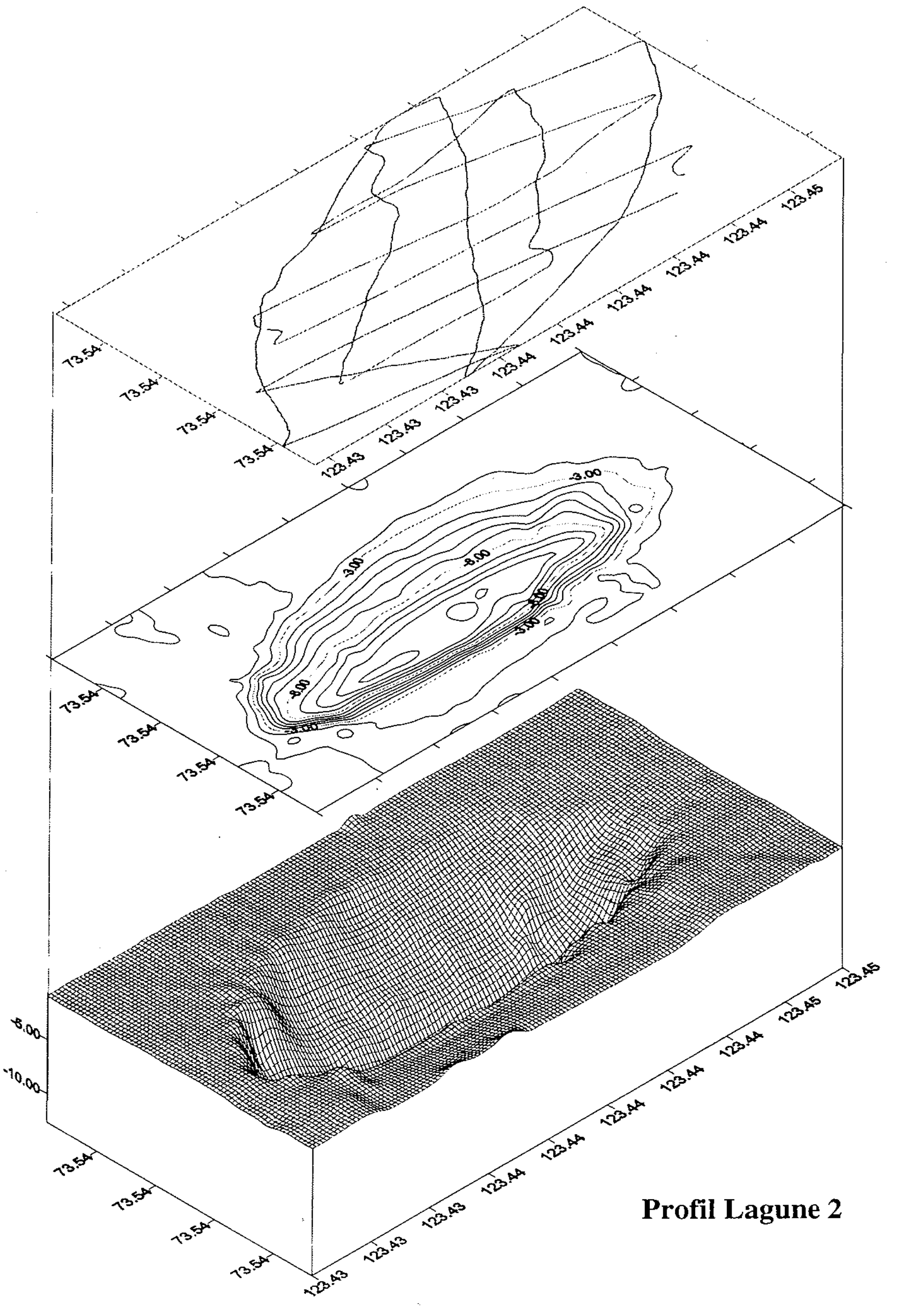


**Figure 7-19:** Course and depth plot for the bathymetric profiling of Sanga-Lake lagoon and three dimensional picture of the underwater topography.

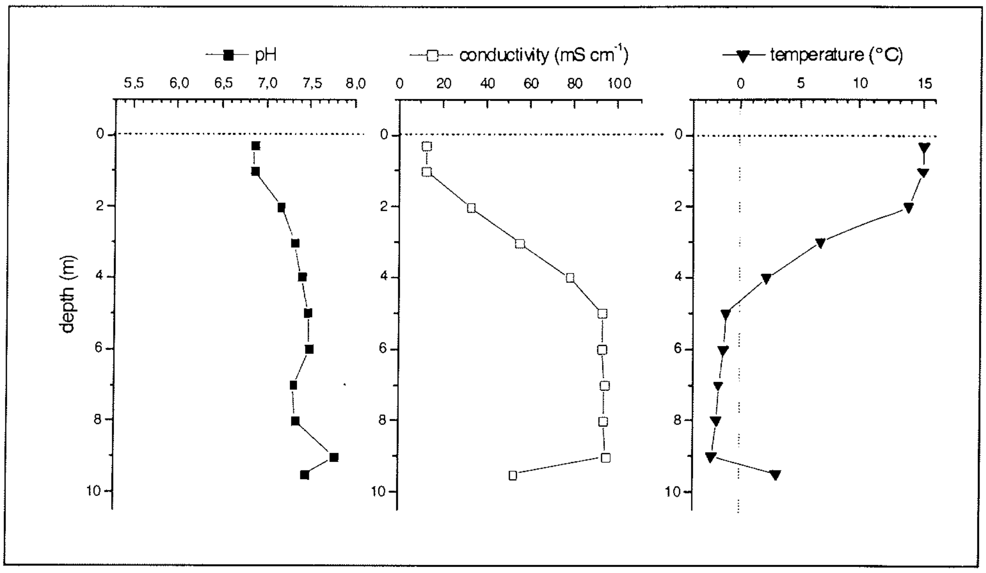


**Figure 7-20:** pH, electric conductivity and water temperature plotted against water depth, Ugly Laguna (Site UL), 28 July 2001.

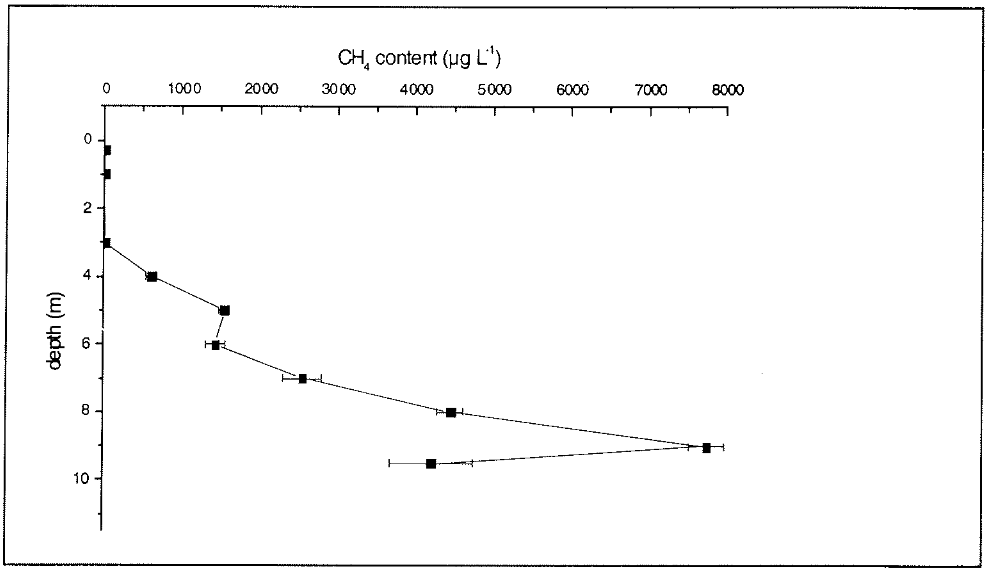


**Figure 7-21:** $CH_4$ content plotted against water depth, Ugly Laguna (Site UL), 28 July 2001.

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# 8 Paleoecological and permafrost studies of Ice Complex in the Laptev Sea area (Bykovsky Peninsula)

*(A. Sher, S. Kuzmina, O. Lisitsyna, I. Parmuzin, S. Demyankov)*

## 8.1 Introduction, objectives and logistics

Multidisciplinary research of the Late Pleistocene Ice Complex in the Lena Delta (Bykovsky Peninsula, Mamontovy Khayata Cliff) under the Russian-German project "Laptev Sea System 2000" in 1998-99 provided the most detailed, continuous and well dated record of the past environment of the Laptev Shelf Land during the last 50 ka (Schirrmeister et al., 2002). An important component of that study was a unique succession of fossil insect assemblages, which allowed recognizing the trends and stages in the development of landscape and climate in the Late Pleistocene and Early Holocene (Kuzmina, 2001). It was for the first time revealed that the early Karginian and late Sartanian environment had much in common, as the corresponding insect assemblages included a large number of steppe species. That implied a relatively warm and arid tundra-steppe environment that existed under extremely continental climate with summers warmer than today, especially during the latter interval. The late Karginian (35-25 ka) and especially early Sartanian (corresponding to the LGM) were marked by lower summer temperature, but retained essential aridity (Sher et al., 2001).

The previously obtained record, however, included some gaps, and required a finer sampling resolution, especially during the critical periods of environmental changes. Among those periods were the transition from the Last Glacial Maximum (LGM) to the "warm" stage in the Late Sartanian (previously estimated as about 18,000 $^{14}C$ years BP), the beginning of the LGM, and the Pleistocene/Holocene transition. Also, an additional characteristics of faunas of the LGM itself (first time discovered in 1999 and based on three samples only) was vitally important. There were also some gaps in the ice wedge sampling for $^{18}O$ isotope analysis, which was important to estimate past winter temperature. The earlier obtained geocryological description of the upper part of the Ice Complex sediment was not sufficient enough. Some important geological and permafrost problems, raised by the previous research, remained unsolved. In particular, such questions were insufficiently understood as the observed cyclic character of the Ice Complex deposits, the origin of "paleosol" horizons, the nature of stratified units in the section (sedimentary or purely cryological ?), and the processes, which occurred during the termination of the Ice Complex accumulation and beginning of the early Holocene thermokarst outburst. Finally, it was important to find more mammal bones *in situ* in permafrost, both for the dating purposes, and for various analyses, such as the oxygen isotope and DNA studies currently in progress.

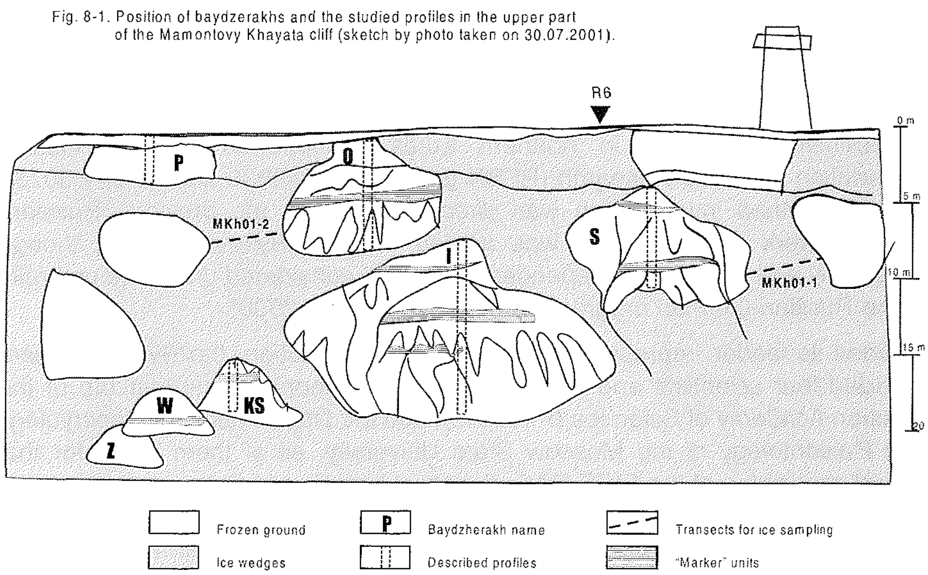
With all those aims and tasks, a Russian team continued the study of Mamontovy Khayata in 2001. The Bykovsky expedition team was organized by the Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences (SIEE RAS) as a part of the research project "Mammoth evolution and environmental changes in northern Eurasia" supported by the Russian Foundation for Basic Research (RFBR grants 01-04-48930 and 01-04-63073). As the planned investigation was directly related to the previous Russian-German work at this site, it was agreed that the Bykovsky team, though logistically and financially independent, would be considered under the umbrella of the Russian-German program "Laptev Sea System 2000".

Besides its leader, representing the organizing institution, the Bykovsky team included four scientists and students from the Paleontological Institute of the Russian Academy of Sciences (PIN RAS), and the Departments of Geocryology and Paleontology of the Moscow State University, all of them being for that period associates of the SIEE RAS. Essential logistic and financial support was rendered by the partner expedition of the Institute of Fundamental Problems of Biology RAS (Pushchino), led by Dr. David Gilichinsky and managed by Victor Sorokovikov. We highly appreciate this support, without which the Bykovsky team work would be hardly possible. We also thank the Lena Delta Reserve, and Mr. Ivan Vorobyov and Dr. Alexander Gukov in particular, for their permanent assistance, and our German colleagues (AWI-Potsdam) for lending some very useful working equipment.

## 8.2 Methods and field measurements

In the general investigation of the section, we followed the same method, which was successfully used in 1999: the tracing of continuous section through a "chain" of closely positioned baydzherakhs, with some overlap at their tops and bottoms. In 2001, we were able to build such a "chain" from the very top of the section (39 m above sea level, a.s.l.), at its almost highest point, to the depth of about 22 m (Fig. 8-1), which earlier yielded $^{14}$C dates around 35-36 ka (below this level, the radiocarbon dates show some dispersion, and individual layers can be dated with some approximation only). Instrumental survey helped to reconstruct the earlier landmarks, most of which were not preserved since 1998-99, and to correlate with the previous altitude/depth estimates. During the 2001 summer, the thawing of the cliff was quite active, so we had to repeat the depth survey several times and to reconstruct the markers (which were drilled-in sticks along the ice wedges).

The main problem of sampling for macrofossil screening (to obtain insect, plant, bone and other fossils larger than 0.5 mm mesh) was common for the study of permafrost sediments. To obtain a representative number of fossils, which can be used for statistical analysis, a large volume of sediment is required (more than 50 kg). Earlier, such samples were taken from a thawed crust of a layer to be sampled, still preserved in its original place. Normally, to get the necessary volume at once is impossible, even if we are able to take the thawed sediment



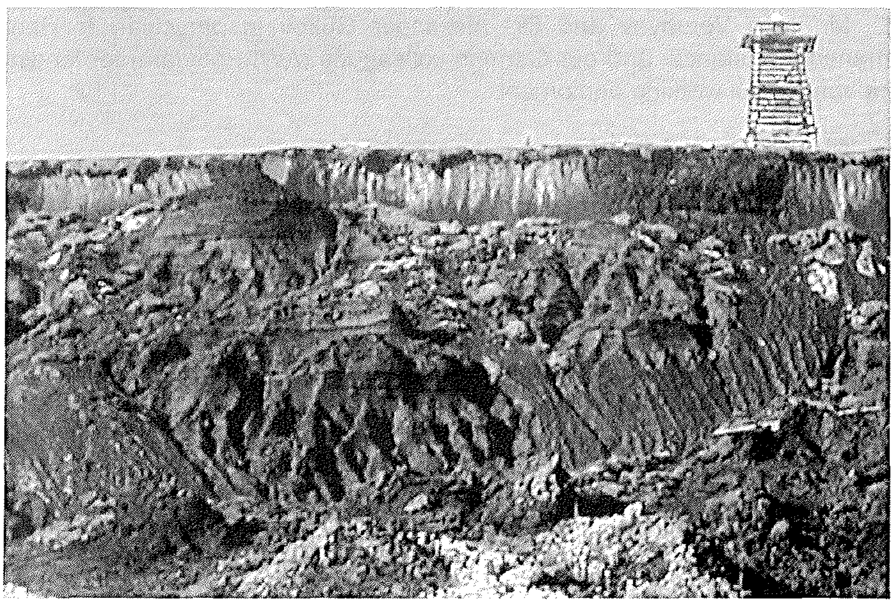



**Figure 8-1**: Position of baydzherakhs and the studied profiles in the upper part of the Mamontovy Khayata cliff (sketch by photo taken on 30.07.2001).

from 2-3 m strike of the same layer. Besides the need to come back to the same layer several times for the collecting its newly thawed portion, such a technique has a number of other disadvantages. Some cryolithological varieties do not form such a crust during the thaw, but turn into liquid mud immediately after melting; being confined in sampling to the thawed spots, you often cannot take the sample exactly in the place, where you need it for stratigraphy, etc. That means that large-volume samples should be taken from frozen, undisturbed sediment, which would allow more precise stratigraphic control and minimize possible contamination. We tried several techniques to take such samples, including the chain-saw, chisel and hammer, etc, but none of the instruments was effective. Finally, we came to the usage of a big axe, with which we tried to make a few grooves on a frozen surface, deep enough to eventually chop off a more or less large block of frozen rock (20-30 cm). By this primitive technique it was possible to take one or two samples during the whole day, but some of them turned still insufficient after melting (because of high ice content), and needed additional sediment to be taken later.

Thus, for the first time, most samples were taken not from the thawed sediment on the slope, but chopped from permafrost. In total, 23 samples were taken and screened for fossil insects, mostly from the upper part of the section (Fig. 8-2, Table A8-1, A8-2, A8-3). At the same time, 35 general sediment samples (for pollen, $^{14}C$ dating, etc.) were taken (also chopped from permafrost).

For oxygen isotope analysis, ice samples were taken from several ice wedge transects, following the instructions, given by Dr. H. Meyer (AWI-Potsdam). We used a chain saw to cut a transverse step across the ice wedge, and to cut sample blocks every 10 cm from the step. The ice blocks were finally separated by chisel and hammer and put in the pre-labeled zip-bags. After melting under normal temperature and precipitation of most of the sediment, a part of water was poured into sealable sampling bottles. The rest of the sample, after stirring up, was filtered through the 0,5 mm mesh, and the residual dried and put in plastic bags for further study. In total, 110 ice/water samples were taken from 5 transects (see details in the next section).

In course of the cryolithological description of the section, frozen samples were taken to define full moisture content by standard technique (weighing-drying-weighing).

## 8.3 Preliminary results

The geological and geocryological investigation in the top part of the MKh section in 2001 agrees quite well with the observations made in 1999. Although we worked in 2001 only a little aside from the 1999 profiles, we definitely observed different baydzherakhs (bdzkhs), as the rate of thermo-denudation and retreat of the top part of the cliff is very high. Only bdzkh "S" probably represented the remains (the lower part) of the '99's bdzkh "E".

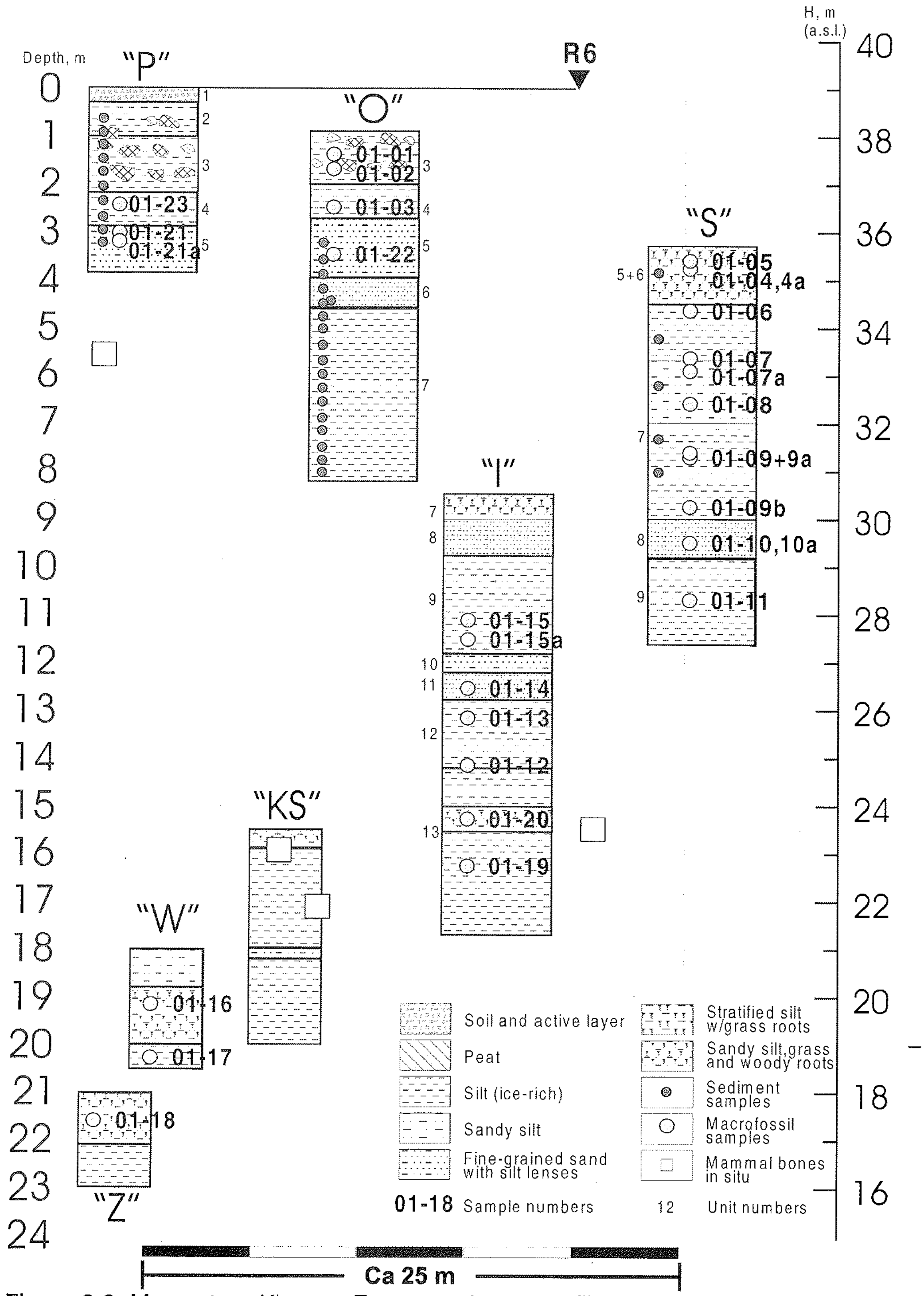



**Figure 8-2:** Mamontovy Khayata Exposure. Areas, profiles and sampling in 2001

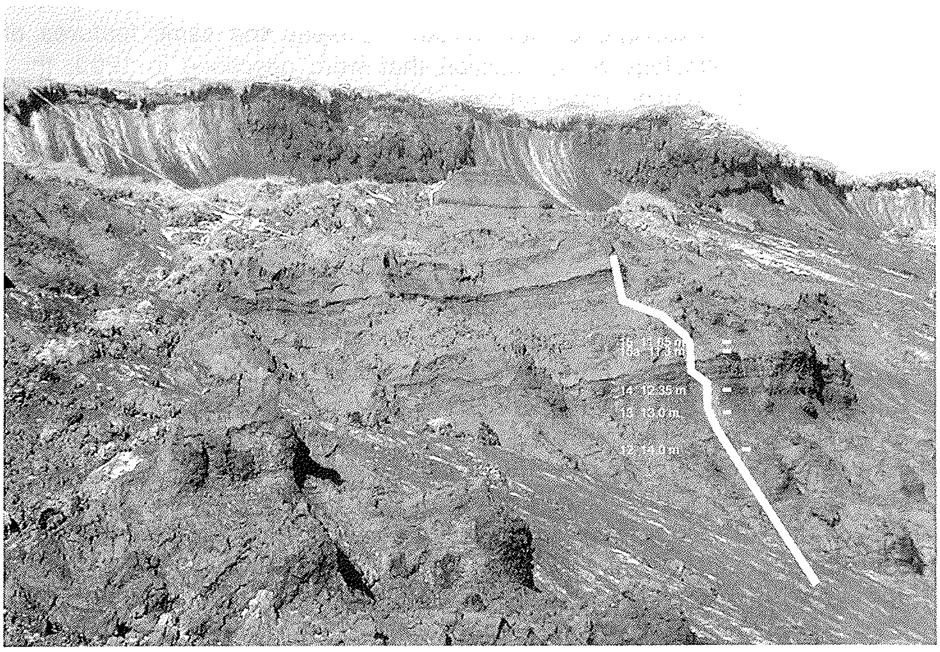


**Figure 8-3:** Mamontovy Khayata, 30.07.2001. Side view of baydzherakh "I". Two "marker" units are well visible because of their stratified appearance and steep part in the profile. Behind it – then still preserved - dome of bdzkh "S" with its upper "marker" unit.

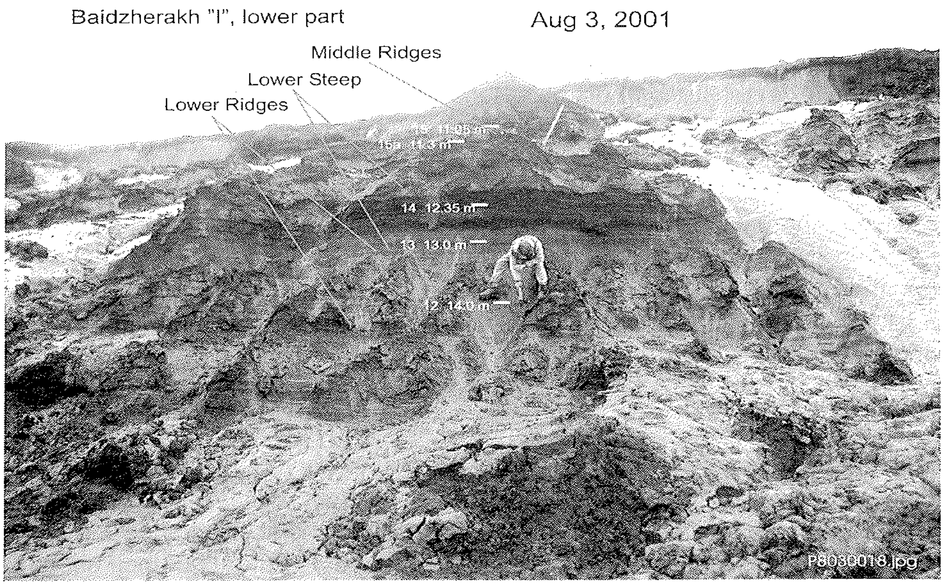



**Figure 8-4:** Mamontovy Khayata, 03.08.2001. The lower "steep" part of baydzherakh "I" with the "marker" unit 11 at 12,2-12,8 m depth.

Nevertheless, the exposure of new bdzkhs revealed the same features of geology and cryolithology of the section that were described in 1999, thus corroborating our earlier observations (Sher et al., 2000). The following regularities were noticed in 1999 and confirmed in 2000:

There are a few levels of baydzherakhs in the upper half of the MKh cliff, and they all have essentially the same construction, reflecting the cyclic character of cryogenic sedimentation. This construction gives similar appearance to most of the baydzherakhs which is explained by the fact that the pattern of exposing and further denudation of each of them is predefined with the same sequence of cryolithological units with peculiar properties. The most noticeable unit (B) forms very steep or vertical step on the bdzkh's seaside front; it has generally darker color and a stratified appearance, and includes abundant grass roots (Fig. 8-3, 8-4). In 1999, we provisionally labeled it as "paleosol", but we were not able to get any strong confirmation either of the soil origin of this unit, or of lithological nature of its stratification. On the contrary, it was concluded that the visually observed stratification was caused mostly by intercalation of horizontal layers with different cryogenic structure (see Unit 6 in "O", Unit 8 in "S", Unit 12 in "I", Table A8.1). Although neither lithological base of this cryogenic stratification, nor the soil origin of this unit cannot be excluded, we prefer now to use more prudent term "the marker unit". The latter is always underlain by silt layer (A) with generally higher ice content, without visible stratification, and forming radiating "ridges" below the "marker unit", i.e. in the lower part of the bdzkh. The "ridges" are formed by exposed frozen sediment, while along the "valleys" between them mud flows creep down. This feature gives the baydzerakhs in the upper part of the MKh cliff their peculiar "octopus"-like appearance (Fig. 8-5, 8-6). The unit (C) above the "marker", forming the upper part of a more or less steep step, normally is enriched with sand particles (sandy silt or silty sand) and sometimes demonstrates horizontal lens-like -wavy lamination. All three units include more or less abundant organic material – grass roots, woody roots and twigs, sometimes peaty spots, but its distribution is uneven, and may have some regularities. For instance, although the grass roots are present in all types of layers, the units of the B-type are most rich for grass roots, which form long furcating systems. Woody roots are common both for the type A and C units, but their maximum concentration was more often observed in C. So, each bdzkh basically includes one cycle of these three units (from the bottom): A, B, and C, about 4-5 m in total thickness. Some of them, however, may cover two cycles (as "S" and "I" in our case) and provide a continuous section 7-10 m long (measured by vertical).

Interesting observations were made on the units of A-type. It turned out that the "ridges" have a slightly different cryostructure from the "valleys" separating them, or they may even have a slightly different lithology. That shows, that the "ridges" and "valleys" are not just random erosional features, but their shape is somehow predefined by their structure. This observation has even raised the suggestion that the ridges include some "xenoliths" of the sediment from the layers above, that was melted, dropped or slid down, and then was refrozen.

That is, however, hardly possible to happen in the second half of summer, when thawing and denudation are very fast, the frozen surfaces are "refreshed" every day by loosing several centimeters of frozen ground, and the appearance of some bdzkhs can be hardly recognized after a week. Unfortunately, this phenomenon could not been fully understood, as it requires special subtle studies.

Very informative were the observations on the dynamics of the bdzkh development in course of the cliff denudation, especially in the upper level. Originally, they appear on the upper wall of the cliff as shallow synclinal troughs (up to 2 m deep) in the middle of long ice walls. They all include the Holocene "peat hummock" unit, and look like the insertions into the Pleistocene polygonal system from the top of the Yedoma (Fig. 8-7). With time, however; they gradually come forward from the ice wall, broaden at the base (due to fast melting of ice beneath them). Now they look as very broad trapezoid-shaped baydzerakhs, still mainly attached to the Yedoma surface, with relatively narrow ice wedges between them. Since that time, the process of their separation from the Yedoma starts: for a week or two they look like the capes, still attached to the main surface and covered with tundra sod. The adjoining ice wedges melt very fast, and the more the bdzkh protrudes from the wall, the faster denudation on its sides goes, so at this stage it acquires a typical conic shape and starts to look much narrower than the adjoining ice wedges. By the end of this stage (even before the complete separation from the Yedoma), the bydzkh commonly already has a sub-vertical step in the middle (Unit B) and the "ridges" at the bottom (Unit A) are becoming more and more clear. When the bydzkh finally looses the connection with the Yedoma surface (a longitudinal ice wedge appears between it and the Yedoma), its denudation goes still faster, as it is now exposed from the back side as well. At the same time, more and more frozen sediments are getting exposed at the bottom, and the base of the now "octopus"-like bdzkh becomes very broad, much broader than the adjoining ice wedges. Behind it, the latitudinal ice wedge now forms the upper part of the cliff, and the latter now looks as a continuous ice wall, giving the erroneous impression of extremely wide ice wedges, while a few meters down they look normal (narrower than the bdzkhs are).

Due to the essential similarity of the 2001 exposure appearance to the 1999 one, we were able to provide a provisional correlation with the earlier described units, and thus to estimate preliminarily the age of the new units and the observed sedimentation cycles from the earlier dating. The top level of bdzkhs – "P" and "O" – correlate with "H" and "E" of 1999. They include the Early Holocene "peat hummock" unit, which is dated around 8000 y BP, and the Pleistocene sequence from about 18 to 12 ka. Bdzkh "S" also belonged to that level, but its upper part has already been destroyed, and the increment at its bottom incorporated the sediments of the earlier cycle. Its studied part correlates with the downward extension of "E" (with the date of 19340 y BP) and with the bdzkh "V" of the second level that was dated from 23800 to 20600 y BP. Bdzkh "I" of the second level also covers at least two cycles: one is the

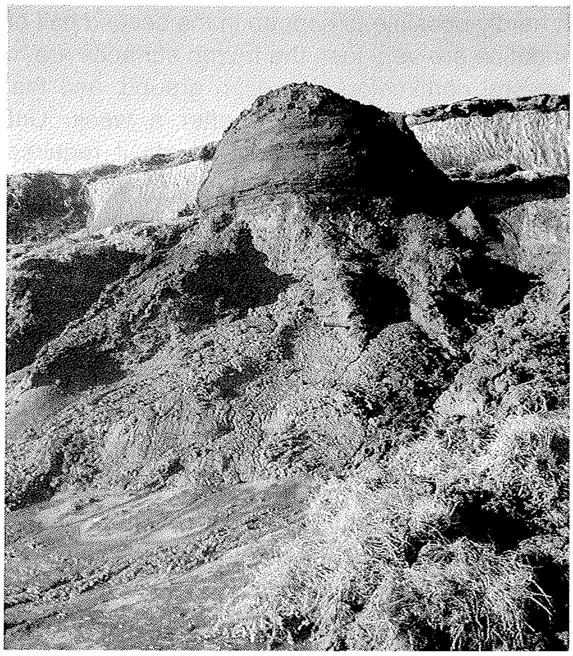


**Figure 8-5:** Mamontovy Khayata, 24.08.2001. View of baydzherakh "O" in the top level of bdzhks. The "marker" unit at the bottom of the steep part and the "ridges" further down, built by ice silt, suggest the "octopus"-like appearance.

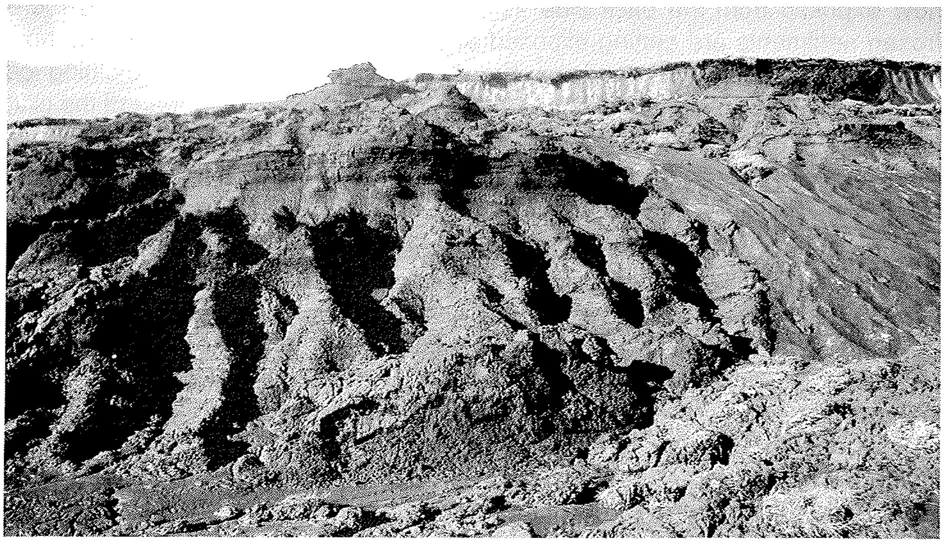


**Figure 8-6:** Mamontovy Khayata, 30.07.2001. View of baydzherakh "I" from the sea side. The same "marker" unit as in Fig. 8-4.

same as the lower in "S" and as "V", the other correlates with the '99 bdzkh "L" and possibly "M" (26-24 ka). An insufficiently studied bdzkh "KS" possibly correlates with "F" (28110 y BP), while the lowermost bdzkhs "W" and "Z" are built with the sediment that most likely was formed within the span of 30-35 ka.

Following the program of our field work, we sampled with greater detail the top of the section and the interval, approximately covering the time span between 20 and 12 ka (taking both macrofossil and sediment samples) (Fig. 8-2, Table A8-1). Samples for screening were also taken with about 1 m interval in the middle part of the cliff (ca 28 to 20 ka). Three samples were also taken from remarkable "twig horizons" in bdzkhs "W" and "Z".

The main conclusion of the preliminary analysis of the 2001 insect assemblages is that the new sampling confirms the earlier recognized pattern of environmental change (Sher et al., 2001), which is a good indication of the high reliability of the method, and adds some additional details to it. The late Karginian insect assemblages, in line with the previous results, indicate a relatively cold and dry climate with low summer temperature. They are usually dominated by xerophilous tundra species, such as ground beetles *Curtonotus alpinus, Pterostichus (Lyperopherus) sublaevis,* weevils *Mesotrichapion wrangelianum, Hemitrichapion tschernovi,* and *Sitona borealis*; very important is the share of arctic insects (weevil *Isochnus arcticus*).

Fully confirmed is the earlier suggested recognition of two different climatic intervals within the Sartanian stage: the earlier, with the sharp dominance of the arctic weevil *Isochnus arcticus,* indicating a very cold environment, and the later, characterized by typical tundra-steppe conditions (evidenced by the presence of steppe species and dominated by the pill-beetle *Morychus viridis*). However, the beginning of the late Sartanian "warm" interval should most likely be shifted to a later time (from previously suggested 18 ka to about 14 ka). A very short-termed episode of warmer summers was found inside the "cold" Sartanian interval (corresponding to the Last Glacial Maximum). The section interval from which this anomalous sample comes requires further study.

The Early Holocene insect assemblages are sharply different from the late Sartanian ones. In 2001, we traced the boundary between the Pleistocene and Holocene deposits in the Mamontovy Khayata main section to a greater detail. It runs at the depth about 2 m. The gray silt member below it, like the Sartanian sands further down, turned out to be dominated by *Morychus viridis* and to include fossils of meadow-steppe (*Coniocleonus cinerascens, C. astragali)* and steppe (*Stephanocleonus eruditus*) species, thus portraying a typical tundra-steppe environment. The brownish-gray silt with peat inclusions above 2 m is dominated by the mesic tundra ground beetles *Pterostichus (Cryobius) brevicornis* and includes thermophilic species, such as the ground beetles *Blethisa catenaria, Diacheila polita, Elaphrus sp., Trichocellus mannerheimi*, the carrion beetle *Blitophaga opaca*, the rove beetle *Philonthus sp.*, the leaf beetles *Chrysomela blaisdelli*, the ant *Camponotus herculeanus.* The assemblage indicates an environment similar to the modern southern shrub tundra or foresttundra, and a climate warmer than the present one. Such a striking change in faunal composition confirms the existence of a break in sedimentation, earlier suggested by radiocarbon dating as 3-4 thousand years long. Our previous statement on the smooth transition between the Pleistocene and Holocene beetle fauna should be abandoned as it was based on a single sample B-4, which was taken in 1998 at the boundary between the Pleistocene and Holocene and most likely included fossils from both above and below it.

In the previous sampling for the oxygen isotopes of ice wedges there was a gap between about 18 and 12 ka (Schirrmeister et al., 2002). We were supposed to sample additional ice wedge transects, corresponding to this interval (approx. 9 to 4 m depth). Most of the ice wedges in this interval, however, were too wide, and in fact represented crossing wedges of various directions, so it was not possible to select a normal cross-section of one ice wedge. Finally, we managed to make the transect of one well-exposed ice wedge between the bdzkh "S" and the next to NW at the depth of about 10 m (Transect MKh01-1), and the other between the bdzkh "O" and the next to SE at the depth of 7 m (Transect MKh01-2, Table A8-4, A8-5) (Fig. 8-1).

Trying to understand the geological features of the very top of the Ice Complex section (e.g., why the early Holocene "peat-hummock" layer seems to be rather deeply inserted into the big ice wedges obviously of the Pleistocene age), we made some observations over the ice wedges in this interval. Although the time limitation did not allow us to do any special study of these wedges, we could suppose that there were at least two generations of ice wedges, younger than big (Pleistocene) ice wedges (Type 1). The first (Type 2) had the bodies almost completely inside the big wedges, but their tops protruded a little (ca 20-30 cm) above the upper edge of the big wedge, so that their "shoulders" were clearly related to a younger sediment layer than immediately overlying the big ice wedge. At the same time, they did not seem modern (growing). The second generation (Type C) were the modern and growing ice wedges of smaller size, with clear shoots (stocks) reaching the bottom of the active layer. The best examples of the second were found inside the peat "sinclines", which, as we know, had mostly early Holocene age. The third kind (Type 4 ?) were the wedges, up to 1.5 m width at the top, narrowing downwards, but then broadening and entering the continuous ice wall. They are probably related to the type B, but their upper parts are not within the Pleistocene wedges, but within the ground blocks (later forming baydzerakhs). Besides all that, the upper edge of the big wedges (Type 1) shows many small shoots, intruding the overlying sediment, but hardly reaching the bottom of active layer. So we made two transects and sampled across one ice wedge of Type 4 – at its narrow waist (Transect MKh01-3a), and the broader lower part (Transect MKh01-3b), and one transect of a modern wedge of Type C (Transect MKh01-4) (Table A8.4, A8-5). All the samples are currently being analyzed by Dr. Hanno Meyer in AWI-Potsdam.

An almost permanent search for *in situ* fossil bones of mammals was not very successful. However, two bones of horses were found in the baydzherakhs of

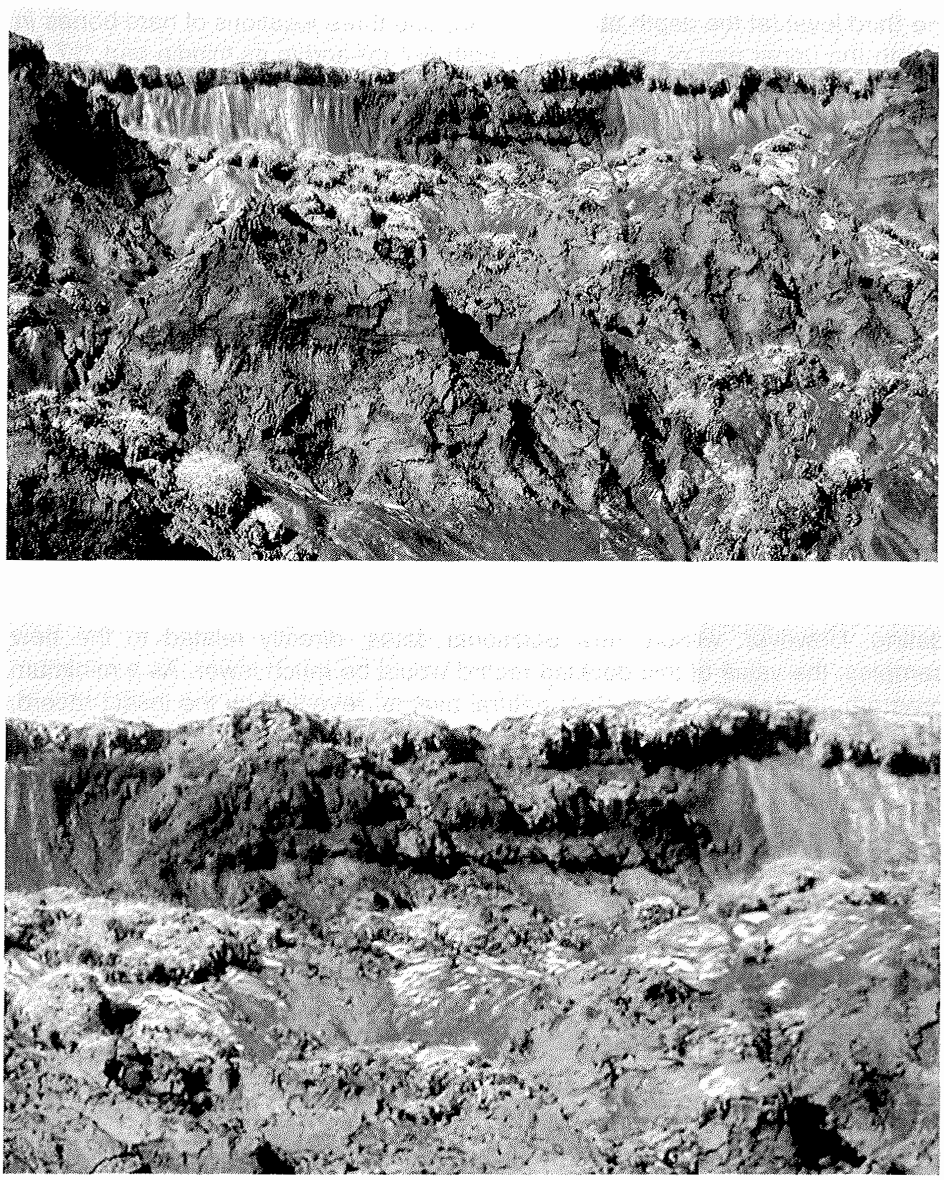


**Figure 8-7a,b:** Mamontovy Khayata, 30.07.2001. Initial stage of exposing of a baydzherakh of the top level. Currently only the Early Holocene "peat hummock" unit is visible. In a few weeks this ground block will separate from the upper wall as the baydzherakh "P", and soon after will look as "O".

the third level (at the depth about 15-17 m) and three locations of hare bones *in situ* in the upper part of the section (depth 5-7 m) and in its middle part (17 m) (Fig. 8-2). Some samples of these *in situ* bones were kept frozen for further DNA and isotope analyses. Collecting of fossil mammals on the shore and bars (both of Mamontovy Khayata and the Came Mamont) yielded some interesting specimens of mammoth, musk-ox and some other mammals (Table A8-6).

One more result of the summer work was our participation in the description and collection of an Early Holocene moose carcass in the SW part of the general Mamontovy Khayata area, initiated and carried out by the Lena Delta Reserve scientists (Sher et al, in press).

## 8.4 Further investigations

We believe that the results of our field work will contribute to a better understanding of some questions of the Late Pleistocene and Early Holocene environment. So far, a good progress has been reached in the study of fossil insect assemblages from the new samples, which offer a higher resolution of the record of insect fauna and other natural conditions. As mentioned above, we can estimate an approximate age of fossil assemblages from the previous dating. However, without new additional dates, directly related to the new samples, the value of this detailed record would be much lower. As a minimum program, the following important natural events, revealed by the insect record, require precise dating: the last steppe-like fauna and the earliest Holocene sediment above it (after the break); the transition from the "cold" faunas of the LGM to the first fauna, enriched with steppe components in the Late Sartanian; the beginning of the LGM-correlated cold stage. No funds for the dating are available in our institutions, so we must apply to the Laptev Sea System program or other sources to look for funding for 8-10 AMS dates.

Of the other materials obtained in the course of our field work, only ice isotope samples are currently in work. The future of the other materials, collected in 2001, such as the samples for pollen and other analyses, should be discussed with our German colleagues.

## 8.5 References

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# 9 Appendix

**Contents:**

Table A3-1 (page 1): Soil types of the central Lena Delta. August 2001. US-American, international, German, and Russian classification.

| profile ID | location | altitude a. s. l. (m) | relief | microrelief | water level (cm) | perma-frost depth (cm) | vegetation | substrate | Soil Taxonomy[1] | World Reverence Base[2] | Bodenk. Kartier-anleitung[3] | Jelovskaya[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LD01-E-01 | Samoylov | 5 | floodplain, level | - | | 73 | Deschampsia caespitosa, Equisetum arvense, Poa viviparum | layered fluviatile sands, mud-layers | Psammentic Aquorthel | Fluvi-Gleyic Cryosol (Arenic) | (Permafrost) Gley-Rambla | Permafrost Alluvial Layered Poorly Developed (Primitive) Sandy |
| LD01-E-02 | Samoylov | 11 | 1. main terrace, delta terrace, gently inclined | centre of low-centred polygon, weak microrelief | | 21 | moss-lichen-tundra; Carex aquatilis, Carex spec., Salix glauca, Dryas octopetala, Arctous erythrocarpa, Saxifraga spec. | shallow autochthonous moss peat above fluviatile sands | Typic Aquorthel | Gleyi-Histic Cryosol (Areni-Fluvic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| LD01-E-03 | Samoylov | 11 | 1. main terrace, delta terrace, gently inclined | low rises: dunes? | | 99 | moss-lichen-tundra, covered by sand | fluviatile und eolian sands | Typic Psammorthel | Areni-Fluvic Cryosol | übersandete Permafrost-Paternia | Permafrost Alluvial Turfness |
| LD01-E-04 | Samoylov | 13 | 1. main terrace, delta terrace, level | centre of low-centred polygon | 8 | 28 | Carex aquatilis, Potentilla palustris, Salix glauca, mosses, lichens | shallow autochthonous moss peat above layered fluviatile sands/loams | Typic Historthel | Gleyi-Histic Cryosol (Fluvic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| LD01-E-05 | Samoylov | 13 | 1. main terrace, delta terrace, level | rim of low-centred polygon | | 29 | Carex aquatilis, Salix glauca, Dryas octopetala, Arctous erythrocarpa | shallow autochthonous moss peat above fluviatile sands | Glacic Aquiturbel | Gleyi-Turbic Cryosol (Fluvi-Glacic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| LD01-E-06 | Samoylov | 13 | 1. main terrace, delta terrace, level, close to bluff | centre of high-centred polygon | | 30 | moss-lichen-sedge-tundra | fluviatile sands | Typic Aquorthel | Gleyi-Histic Cryosol (Areni-Fluvic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| LD01-E-07 | Samoylov | 13 | 1. main terrace, delta terrace, level, close to bluff | rim of high-centred polygon | | 38 | sedge-moss-tundra | shallow autochthonous moss peat above fluviatile sands | Psammentic Aquiturbel | Gleyi-Turbic Cryosol (Areni-Fluvic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| | | | | | | | | | | | | |

Table A3-1 (page 2): Soil types of the central Lena Delta. August 2001. US-American, international, German, and Russian classification.

| profile ID | location | altitude a. s. l. (m) | relief | microrelief | water level (cm) | perma-frost depth (cm) | vegetation | substrate | Soil Taxonomy[1] | World Reverence Base[2] | Bodenk. Kartier-anleitung[3] | Jelovskaya[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LD01-E-08 | Samoylov | 10 | floodplain: "High-Floodplain",, level, close to bluff | | 58 | 62 | Carex spec., Salix spec. | fluviatile sands | Psammentic Aquorthel | Fluvi-Gleyic Cryosol (Arenic) | (Permafrost) Auengley | Permafrost Alluvial Turfness Gley |
| LD01-K-01 | Kurungnakh | 50 | at the summit of a pingo, steep slope, alas on the 3. main terrace (ice complex) | | | 70 | Salix glauca, Astragalus umbellatus | fluviatile silts, alas deposits | Typic Aquiturbel | Gleyi-Turbic Cryosol | (Permafrost) Hang-Oxigley | Permafrost Tundra Kryoturbit ? |
| LD01-K-02 | Kurungnakh | 25 | alas depression on the 3. main terrace (ice complex) | centre of low-centred polygon | 1 | 40 | Potentilla palustris, Carex aquatilis, Aulacomnium spec., Sphagnum spec. | autochthonous moss peat above fluviatile silts (alas) | Typic Hemistel | Gleyi-Cryic Histosol | (Tundra) Moor | Permafrost Peat-Gley |
| LD01-K-03 | Kurungnakh | 25 | alas depression on the 3. main terrace (ice complex) | rim of low-centred polygon | 20 | 24 | Carex aquatilis, Salix spec., Betula nana, mosses, lichens | autochthonous moss peat above fluviatile silts (alas) | Glacic Histoturbel | Gleyi-Histic Cryosol (Glacic) | (Tundra) Moorgley | Permafrost Peatish-Gley |
| LD01-K-04 | Kurungnakh | 40 | 3. main terrace (ice complex), gently inclined | centre of low-centred polygon, weak microrelief | 2 | 27 | Carex aquatilis, Potentilla palustris, mosses | moss- and sedge peat | Typic Hemistel | Gleyi-Cryic Histosol | (Tundra) Moor | Permafrost Peat-Gley |
| LD01-K-05 | Kurungnakh | 40 | 3. main terrace (ice complex), gently inclined | rim of low-centred polygon, weak microrelief | 20 | 25 | Carex aquatilis, Salix reptans, Betula nana, Poa spec., Hylocomium splendens | shallow moss peat abov fluviatile silts | Glacic Histoturbel | Gleyi-Histic Cryosol (Glacic) | (Tundra) Moorgley | Permafrost Peatish-Gley |
| | | | | | | | | | | | | |

**Table A3-1 (page 3): Soil types of the central Lena Delta. August 2001. US-American, international, German, and Russian classification.**

| profile ID | location | altitude a. s. l. (m) | relief | microrelief | water level (cm) | perma-frost depth (cm) | vegetation | substrate | Soil Taxonomy[1] | World Reverence Base[2] | Bodenk. Kartier-anleitung[3] | Jelovskaya[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LD01-L-01 | Samoylov | 7,5 | floodplain, depression, level | | 65 | 80 | Carex caespitosa, Alopecurus alpinus, Eriophorum sp., Salix glauca, Deschampsia caespitosa, Equisetum arvense, Agrostis stolonifera | layered fluviatile sands, mud-layers | Typic Aquorthel | Fluvi-Gleyic Cryosol | (Permafrost) Auengley | Permafrost Alluvial Turfness Gley |
| LD01-L-02 | Samoylov | 8 | floodplain, low rise | | | 87 | Hedysyarum alp., Oxytropis sp., Polygonum vivip., Castilleja septentr., Koeleria asiati., Armeria maritima, Rumex sp., Parnassia palustris, Salix glauca, Saxifraga hirculus, Dryas punct., Sanguisorba offic., Actous erythroc., Luzula sp., flache Moose | layered fluviatile sands, mud-layers, eolian sands? | Typic Psammorthel | Areni-Fluvic Cryosol | (Permafrost) Paternia | Permafrost Alluvial Turfness |
| LD01-L-03 | Samoylov | 7 | floodplain, depression in front of bluff of 1. main terrace | | 7 | 30 | Carex caespitosa, Eriophorum angustifolium, Agrostis stolonifera, mosses | moss- and sedge peat | Fluvaquentic Fibristel | Gleyi-Cryic Histosol (Fibri-Fluvic) | (Tundra) Moor | Permafrost Alluvial Muddy-Peat-Gley |
| LD01-L-04 | Samoylov | 7,5 | floodplain, depression in front of bluff of 1. main terrace | low moss-hillocks | 15 | 45 | Salix glauca, Equisetum arvense, Equisetum variegatum, Carex aquatilis, mosses | layered fluviatile sands and silts peat layers | Ruptic-Histic Aquorthel | Gleyi-Histic Cryosol (Fluvi-Fibric) | (Tundra) Moorgley | Permafrost Alluvial Muddy-Peatish-Gley |
| LD01-L-05 | Samoylov | 7,5 | floodplain, gentle slope floodplain to beach | | 91 | 98 | Alopecurus alpinus, Poa vivipara, Deschampsia caespitosa, Festuca rubra, Tanacetum bipinnatum | layered fluviatile sands, mud-layers | Typic Psammorthel | Fluvi-Gleyic Cryosol (Arenic) | (Permafrost) Gley-Rambla | Permafrost Alluvial Layered Poorly Developed (Primitive) Sandy |
| | | | | | | | | | | | | |

Table A3-1 (page 4): Soil types of the central Lena Delta. August 2001. US-American, international, German, and Russian classification.

| profile ID | location | altitude a. s. l. (m) | relief | microrelief | water level (cm) | perma-frost depth (cm) | vegetation | substrate | Soil Taxonomy[1] | World Reverence Base[2] | Bodenk. Kartier-anleitung[3] | Jelovskaya[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LD01-L-06 | Samoylov | 9,5 | floodplain: "High-floodplain", depression | centre of low-centred polygon, weak microrelief | 7 | 28 | mosses, Carex aquatilis | moss- and sedge peat | Typic Fibristel | Gleyi-Cryic Histosol (Fibric) | (Tundra) Moor | Permafrost Peat-Gley |
| LD01-L-07 | Samoylov | 11 | 1. main terrace, delta terrace, gently inclined, slope step-like due to polygonal ground | rim of low-centred polygon | 25 | 32 | Hylocomium splendens, Carex aquatilis, Dryas punctata, Salix glauca | shallow autochthonous moss peat above fluviatile sands above peat | Glacic Aquturbel | Gleyi-Histic Cryosol (Fibri-Glacic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| LD01-L-08 | Samoylov | 11 | 1. main terrace, delta terrace, gently inclined, slope step-like due to polygonal ground | centre of low-centred polygon | 5 | 37 | mosses, Carex aquatilis, Pedicularis sp., Caltha palustris | moss peat | Typic Historthel | Gleyi-Cryic Histosol (Fibric) | (Tundra) Moor | Permafrost Peat-Gley |
| LD01-L-09 | Samoylov | 5 | floodplain, depression in front of bluff of 1. main terrace | | 46 | 63 | Carex caespitosa, Poa vivipara, Eriophorum angustifolium | fluviatile silts | Typic Aquorthel | Fluvi-Gleyic Cryosol | (Permafrost) Auengley | Permafrost Alluvial Layered Poorly Developed (Primitive) Muddy |
| LD01-L-10 | Samoylov | 10 | floodplain: "High-floodplain", close to slope | centre of low-centred polygon, weak microrelief | 40 | 47 | Carex aquatilis, Dryas punctata, Astragalus umbellatus, Salix glauca, Lagotis glauca, Luzula sp., Polygonum viviparum, Arctous erythrocarpus, mosses, lichens | fluviatile sands | Psammentic Aquorthel | Fluvi-Gleyic Cryosol (Arenic) | (Permafrost) Hangoxigley | Permafrost Alluvial Turfness Gley |
| | | | | | | | | | | | | |

Table A3-1 (page 5): Soil types of the central Lena Delta. August 2001. US-American, international, German, and Russian classification.

| profile ID | location | altitude a. s. l. (m) | relief | microrelief | water level (cm) | perma-frost depth (cm) | vegetation | substrate | Soil Taxonomy[1] | World Reverence Base[2] | Bodenk. Kartier-anleitung[3] | Jelovskaya[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LD01-S-01 | Sardakh | 10 | 1. main terrace, delta terrace, level | rim of low-centred polygon | | 35 | moss-sedge-tundra: Dryas punctata, Salix polaris, Salix glauca, Pedicularis spec., Carex spec., and a lot more... | shallow autochthonous moss peat above fluviatile sands above peat | Glacic Histoturbel | Turbi-Histic Cryosol (Glaci-Gleyic) | (Tundra) Moorgley | Permafrost Peatish Gley |
| LD01-S-02 | Sardakh | 10 | 1. main terrace, delta terrace, level | centre of low-centred polygon | | 22 | moss-sedge-tundra | moss- and sedge peat | Fluvaquentic Fibristel | Gleyi-Cryic Histosol (Fibri-Fluvic) | (Tundra) Moor | Permafrost Peat Gley |

[1] Soil Taxonomy 8th edition (Soil Survey Staff 1998), [2] World Reference Base for Soil Recources (FAO 1998),
[3] Bodenkundliche Kartieranleitung 4th edition, [4] Jelovskaya, L.G. (1987)

Table Collection A3-2: Soil Profile Deseriptions, Expedition Lena Delta 2001; page 1 of 29

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 1 | **geogr. latitude:** | 72°23.280' N | **profile type:** | small pit | **permafrost depth (cm):** | 73 | **date:** | 11.08.01 |
| **profile ID:** | LD01-E-01 | **geogr. longitude:** | 126°28.763' E | **profile depth (cm):** | 75 | **water level (cm):** | | **editor:** | Pfeiffer |
| **location:** | Samoylov | **elevation a.s.l. (m)** | 5 | **relief:** | floodplain, level | | | | |
| **substrate:** | layered fluviatile sands, mud-layers | | | **microrelief:** | - | | | | |
| **vegetation:** | Deschampsia caespitosa, Equisetum arvense, Poa viviparum | | | | | | | | |

**Soil Tax.:** Psammentic Aquorthel **WRB:** Fluvi-Gleyic Cryosol (Arenic) fv-gl CR (ar) **Jelovskaya:** Permafrost Alluvial Layered Poorly Developed (Primitive) Sandy

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 2 | C1 | Ufs | ein | 1 | 10YR3/1 | 2 | | 0 | 0 | - | |
| 2 | 2 | 9 | C2 | fS | ein | 1 | 10YR4/2 | 1 | | 3 | 0 | - | LD01-8100 |
| 3 | 9 | 28 | AB | fSu2 | koh | 2+1 | 10YR3/1+10YR4/1 | 2 | | 2 | 0 | - | LD01-8101 |
| 4 | 28 | 47 | C3 | fS | ein | 1 | 10YR4/2 | 0 | | 0 | 0 | - | LD01-8102 |
| 5 | 47 | 75 | BgAb | fSl2 | koh | 2 | 10YR2/1 | 3 | | 3 | 7-10 | + | LD01-8103 |
| 6 | 75 | | Bgf | fSl2 | koh | | 10YR2/1 | 3 | | | >10 | + | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 2 of 29**

**serial no.:** 2 **geogr. latitude:** 72°23.242' N **profile type:** small pit **permafrost depth (cm):** 21 **date:** 11.08.01

**profile ID:** LD01-E-02 **geogr. longitude:** 126°29.548' E **profile depth (cm):** 21 **water level (cm):** **editor:** Pfeiffer

**location:** Samoylov **elevation a.s.l. (m)** 11 **relief:** 1. main terrace, delta terrace, gently inclined

**substrate:** shallow autochthonous moss peat above fluviatile sands **microrelief:** centre of low-centred polygon, weak microrelief

**vegetation:** moss-lichen-tundra; Carex aquatilis, Carex spec., Salix glauca, Dryas octopetala, Arctous erythrocarpa, Saxifraga spec.

**Soil Tax.:** Typic Aquorthel **WRB:** Gleyi-Histic Cryosol (Areni-Fluvic) gl-hi CR (ar-fv) **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 8 | Oe1 | | | | 10YR3/1 | 7 | 2-3 | 6 | 0 | - | LD01-8106 |
| 2 | 8 | 10 | Oe2 | | | | 10YR2/1 | 7 | 4 | 5 | 0 | - | |
| 3 | 10 | 21 | ABg | mSu2 | koh-sub | 1 | 10YR3/1 | 3 | | 3 | -5 | (+) | LD01-8107 |
| 4 | 21 | | Bgf | mSu2 | | | 10YR3/2 | 1 | | 0 | 5-10 | + | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 3 of 29**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 3 | **geogr. latitude:** | 72°23.113' N | **profile type:** small pit | | **permafrost depth (cm):** | 99 | **date:** | 11.08.01 |
| **profile ID:** | LD01-E-03 | **geogr. longitude:** | 126°29.971' E | **profile depth (cm):** 99 | | **water level (cm):** | | **editor:** | Pfeiffer |
| **location:** | Samoylov | **elevation a.s.l. (m)** | 11 | **relief:** I. main terrace, delta terrace, gently inclined | | | | | |
| **substrate:** | fluviatile und eolian sands | | | **microrelief:** low rises: dunes? | | | | | |
| **vegetation:** | moss-lichen-tundra, covered by sand | | | | | | | | |

**Soil Tax.:** Typic Psammorthel **WRB:** Areni-Fluvic Cryosol ar-fv CR **Jelovskaya:** Permafrost Alluvial Turfness

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 5 | C1 | mSfs | ein | 1 | 10YR6/2 | 1 | | 1 | 0 | - | LD01-8110 |
| 2 | 5 | 25 | A(b) | fSu2 | ein-koh | 2 | 10YR4/2 | 4 | | 3 | 0 | - | LD01-8111 |
| 3 | 25 | 43 | C2 | mSl2 | ein | 1 | 10YR6/3 | 2 | | 1 | 0 | - | LD01-8112 |
| 4 | 43 | 99 | C3 | mSu3 | koh-ein | 1 | 10YR4/2 | 0 | | 0 | 0 | - | LD01-8113 |
| 5 | 99 | | Cf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 4 of 29**

**serial no.:** 4 **geogr. latitude:** 72°22.532' N **profile type:** small pit **permafrost depth (cm):** 28 **date:** 22.08.01

**profile ID:** LD01-E-04 **geogr. longitude:** 126°30.253' E **profile depth (cm):** 28 **water level (cm):** 8 **editor:** Pfeiffer

**location:** Samoylov **elevation a.s.l. (m)** 13 **relief:** 1. main terrace, delta terrace, level

**substrate:** shallow autochthonous moss peat above layered fluviatile sands/loams **microrelief:** centre of low-centred polygon

**vegetation:** Carex aquatilis, Potentilla palustris, Salix glauca, mosses, lichens

**Soil Tax.:** Typic Historthel **WRB:** Gleyi-Histic Cryosol (Fluvic) gl-hi CR (fl) **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 15 | Oi1 | | | 1 | 10YR2/2 | 7 | 2 | 6 | 0 | - | LD01-8116 |
| 2 | 15 | 21 | Oi2 | | | 1 | 10YR2/1 | 7 | 1 | 5 | -7 | - | LD01-8117 |
| 3 | 21 | 28 | AB | Slu | | 1 | 10YR4/1 | 5 | 1 | 2 | -15 | + | LD01-8118 |
| 4 | 28 | | Bf | Slu | | | 10YR3/1 | 3 | | 0 | 0 | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 5 of 29**

**serial no.:** 5 **geogr. latitude:** 72°22.532' N **profile type:** small pit **permafrost depth (cm):** 29 **date:** 22.08.01

**profile ID:** LD01-E-05 **geogr. longitude:** 126°30.253' E **profile depth (cm):** 29 **water level (cm):** **editor:** Pfeiffer

**location:** Samoylov **elevation a.s.l. (m)** 13 **relief:** 1. main terrace, delta terrace, level

**substrate:** shallow autochthonous moss peat above fluviatile sands **microrelief:** rim of low-centred polygon

**vegetation:** Carex aquatilis, Salix glauca, Dryas octopetala, Arctous erythrocarpa

**Soil Tax.:** Glacic Aquiturbel **WRB:** Gleyi-Turbic Cryosol (Fluvi-Glacic) gl-tu CR (fv-gc) **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 8 | Oi | | | 1 | 7.5YR3/1 | 7 | | 5 | 0 | - | LD01-8121 |
| 2 | 8 | 17 | ABg | fSu3 | koh | 1 | 7,5YR3/1 | 6 | | 5 | -7 | (+) | LD01-8122 |
| 3 | 17 | 28 | Bjjg | fSl? | koh | 2 | 10YR3/1 | 3 | | 3 | -15 | + | LD01-8123 |
| 4 | 28 | | Bjjf | fSl? | | | 10YR3/2 | | | 0 | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 6 of 29**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 6 | **geogr. latitude:** | 72°22.200' N | **profile type:** | small pit | **permafrost depth (cm):** | 30 | **date:** | 23.08.01 |
| **profile ID:** | LD01-E-06 | **geogr. longitude:** | 126°13.341' E | **profile depth (cm):** | 30 | **water level (cm):** | | **editor:** | Pfeiffer |
| **location:** | Samoylov | **elevation a.s.l. (m)** | 13 | **relief:** | 1. main terrace, delta terrace, level, close to bluff | | | | |
| **substrate:** | fluviatile sands | | | **microrelief:** | centre of high-centred polygon | | | | |
| **vegetation:** | moss-lichen-sedge-tundra | | | | | | | | |

Soil Tax.: Typic Aquorthel    **WRB:** Gleyi-Histic Cryosol (Areni-Fluvic) gl-hi CR (ar-fv)    **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 6 | Oi | | | 1 | 7,5YR2,5/3 | 7 | | 5 | 0 | - | LD01-8126 |
| 2 | 6 | 9 | BC | fSu3 | koh-ein | 1 | 7,5YR4/3 | 2 | | 3 | 0 | - | LD01-8127 |
| 3 | 9 | 16 | B/Oe | fSl2+ (-) | koh-sub | 1 | 7,5YR3/3 | 3 | | 1+3 | 0 | - | LD01-8128 |
| 4 | 16 | 30 | Bg | fSu2 | koh | 2 | 7,5YR4/2 | 2 | | 1+2 | 0 | - | LD01-8129 |
| 5 | 30 | | Bgf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 7 of 29**

**serial no.:** 7 **geogr. latitude:** 72°22.200' N **profile type:** small pit **permafrost depth (cm):** 38 **date:** 23.08.01

**profile ID:** LD01-E-07 **geogr. longitude:** 126°13.341' E **profile depth (cm):** 38 **water level (cm):** **editor:** Pfeiffer

**location:** Samoylov **elevation a.s.l. (m)** 13 **relief:** 1. main terrace, delta terrace, level, close to bluff

**substrate:** shallow autochthonous moss peat above fluviatile sands **microrelief:** rim of high-centred polygon

**vegetation:** sedge-moss-tundra

**Soil Tax.:** Typic Aquiturbel **WRB:** Gleyi-Turbic Cryosol (Areni-Fluvic) gl-tu CR (ar-fv) **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 12 | Oi | | | | 7,5YR3/2 | 7 | | 6 | 0 | - | LD01-8132 |
| 2 | 12 | 20 | AB | fSu2 | koh-ein | 1 | 7,5YR3/1 | 5 | | 3 | 0 | - | LD01-8133 |
| 3 | 20 | 26 | Bg | fSu2 | ein | 1 | 7,5YR4/3 + 7,5YR3/2 | 1 | | 2 | 20 | - | LD01-8134 |
| 4 | 26 | 38 | Bjjg | fSu2 | ein | 3 | 7,5YR4/1 | 1 | | 0 | 0 | (+) | LD01-8135 |
| 5 | 38 | | Bjjf | fSu2 | | | 7,5YR4/1 | 3 | | 0 | 0 | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 8 of 29**

**serial no.:** 8
**geogr. latitude:** 72°20.217' N
**profile type:** small pit
**permafrost depth (cm):** 62
**date:** 23.08.01

**profile ID:** LD01-E-08
**geogr. longitude:** 126°29.515' E
**profile depth (cm):** 62
**water level (cm):** 58
**editor:** Pfeiffer

**location:** Samoylov
**elevation a.s.l. (m)** 10
**relief:** floodplain: "High-Floodplain",, level, close to bluff

**substrate:** fluviatile sands
**microrelief:**

**vegetation:** Carex spec., Salix spec.

**Soil Tax.:** Psammentic Aquorthel **WRB:** Fluvi-Gleyic Cryosol (Arenic) (fv-gl) CR (ar) **Jelovskaya:** Permafrost Alluvial Turfness Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 5 | A | fS | kru-ein | 1 | 10YR3/2 | 3 | | 5 | 0 | - | LD01-8138 |
| 2 | 5 | 15 | BC | fSms | ein | 1 | 10YR5/3 | 1 | | 3 | 0 | - | LD01-8139 |
| 3 | 15 | 20 | A(b) | fSu3 | koh-ein | 1 | 10YR3/1 | 3 | | 4 | 0 | - | LD01-8140 |
| 4 | 20 | 29 | BC | mS | ein | 1 | 10YR4/2 | 1 | | 1 | 0 | - | LD01-8141 |
| 5 | 29 | 45 | BgA(b) | fSms | koh-ein | 2 | 10YR4/1 + 7,5YR3/3 | 2 | | 3 | 25 | (+) | LD01-8142 |
| 6 | 45 | 62 | Bg | mSu2 | ein | 2 | 10YR4/1 | 0 | | (1) | 7 | + | LD01-8143 |
| 7 | 62 | | Bf | mSu2 | | | 10YR5/1 | | | 0 | | + | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 9 of 29**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 9 | **geogr. latitude:** | 72°33.459' N | **profile type:** | small pit | **permafrost depth (cm):** | 35 | **date:** | 14.08.01 |
| **profile ID:** | LD01-S-01 | **geogr. longitude:** | 127°10.016' E | **profile depth (cm):** | 35 | **water level (cm):** | | **editor:** | Pfeiffer |
| **location:** | Sardakh | **elevation a.s.l. (m)** | 10 | **relief:** | 1. main terrace, delta terrace, level | | | | |

**substrate:** shallow autochthonous moss peat above fluviatile sands above peat **microrelief:** rim of low-centred polygon

**vegetation:** moss-sedge-tundra: Dryas punctata, Salix polaris, Salix glauca, Pedicularis spec., Carex spec., and a lot more...

**Soil Tax.:** Glacic Histoturbel **WRB:** Turbi-Histic Cryosol (Glaci-Gleyic) tu-hi CR (gc-gl) **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 3 | Oi/C | ( )+fSu2 | | 1 | 10YR3/1 + 10YR3/1 | 7 | 1-2 | 5 | 0 | - | LD01-8018 |
| 2 | 3 | 9 | Oi1 | | | 1 | 10YR3/2 | 7 | 1 | 4 | <15 | - | LD01-8019 |
| 3 | 9 | 10 | Oi2 | (fSu) | | 1 | 7,5YR4/6 | 7 | 1 | 1 | -80 | - | LD01-8020 |
| 4 | 10 | 20 | Bjjg/Oi | fSu2 | | 2-3 | 10YR3/2 | 6 | 1 | 0 | -7 | - | LD01-8021 |
| 5 | 20 | 35 | Bjjg | fSu2 | | 3 | 10YR2/2 | 4 | | 0 | 0 | + | LD01-8022 |
| 6 | 35 | | Oif | | | | 10YR2/1 | 7 | 1 | 0 | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 10 of 29**

**serial no.:** 10 | **geogr. latitude:** 72°33.459' N | **profile type:** small pit | **permafrost depth (cm):** 22 | **date:** 14.08.01

**profile ID:** LD01-S-02 | **geogr. longitude:** 127°10.016' E | **profile depth (cm):** 22 | **water level (cm):** | **editor:** Pfeiffer

**location:** Sardakh | **elevation a.s.l. (m)** 10 | **relief:** 1. main terrace, delta terrace, level

**substrate:** moss- and sedge peat | **microrelief:** centre of low-centred polygon

**vegetation:** moss-sedge-tundra

**Soil Tax.:** Fluvaquentic Fibristel **WRB:** Gleyi-Cryic Histosol (Fibri-Fluvic) gl-cy HS (fi-fv) **Jelovskaya:** Permafrost Peat Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 2 | C | fSu2 | | 1 | 10YR3/1 | 3 | | 3 | 0 | - | LD01-8025 |
| 2 | 2 | 18 | Oi1 | | | 1 | 7.5YR4/6 | 7 | 2 | 5 | 0 | - | LD01-8026 |
| 3 | 18 | 22 | Oi2 | | | 1-2 | 7.5YR2.5/2 | 7 | 1 | 4 | 0 | - | LD01-8027 |
| 4 | 22 | | Oif | | | | 7.5YR2.5/3 | 7 | 1 | 0 | 0 | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 11 of 29**

**serial no.:** 11 **geogr. latitude:** 72°22.550' N **profile type:** small pit **permafrost depth (cm):** 98 **date:** 13.08.01

**profile ID:** LD01-L-05 **geogr. longitude:** 126°27.644' E **profile depth (cm):** 98 **water level (cm):** 91 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 7,5 **relief:** floodplain, gentle slope floodplain to beach

**substrate:** layered fluviatile sands, mud-layers **microrelief:**

**vegetation:** Alopecurus alpinus, Poa vivipara, Deschampsia caespitosa, Festuca rubra, Tanacetum bipinnatum

**Soil Tax.:** Typic Psammorthel **WRB:** Fluvi-Gleyic Cryosol (Arenic) fv-gl CR (ar) **Jelovskaya:** Permafrost Alluvial Layered Poorly Developed (Primitive) Sandy

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 11 | A | fSl2 | ein+koh | 1 | 10YR4/2 | 2+3 | | 4 | 10, weak | - | LD01-8077 |
| 2 | 11 | 21 | Ab/C | fSu2+mS | koh+ein | 1 | 10YR5/3 | 1 | | 4 | 0 | - | LD01-8078 |
| 3 | 21 | 29 | Ab1 | fSu2 | koh | 1 | 10YR3/1 | 3 | | 4 | 0 | - | LD01-8079 |
| 4 | 29 | 36 | C1 | mS | ein | 1 | 10YR6/3 | 1 | | 3 | 0 | - | LD01-8080 |
| 5 | 36 | 41 | Ab2 | fSu2 | koh | 1 | 10YR4/1 | 3 | | 3 | 0 | - | LD01-8081 |
| 6 | 41 | 75 | C2 | mS | ein | 1 | 10YR5/3 | 1 | | 0 | 0 | - | LD01-8082 |
| 7 | 75 | 98 | Cg | mS | ein | 1 | 2,5Y4/1 | 1 | | 0 | 30 | - | LD01-8083 |
| 8 | 98 | | Cgf | | | | | | | | | | |

**serial no.:** 12 **geogr. latitude:** 72°22.538' N **profile type:** small pit **permafrost depth (cm):** 80 **date:** 10.08.01

**profile ID:** LD01-L-01 **geogr. longitude:** 126°27.898' E **profile depth (cm):** 80 **water level (cm):** 65 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 7,5 **relief:** floodplain, depression, level

**substrate:** layered fluviatile sands, mud-layers **microrelief:**

**vegetation:** Carex caespitosa, Alopecurus alpinus, Eriophorum spec., Salix glauca, Deschampsia caespitosa, Equisetum arvense, Agrostis stolonifera

**Soil Tax.:** Typic Aquorthel **WRB:** Fluvi-Gleyic Cryosol fv-gl CR **Jelovskaya:** Permafrost Alluvial Turfness Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 9 | A | fSlu | koh | 1-2 | 10YR3/1 | 4 | | 5 | 0 | - | LD01-8054 |
| 2 | 9 | 17 | C1 | fSms | ein | 1 | 10YR4/2 | 1 | | 2-3 | 0 | - | LD01-8055 |
| 3 | 17 | 31 | Ab | Sl3 | koh | 2 | 10YR3/1 | 3 | | 3 | 0 | - | LD01-8056 |
| 4 | 31 | 40 | Cg2 | fSms | ein | 1 | 10YR5/3 | 1 | | 1 | 10-15 | - | LD01-8057 |
| 5 | 40 | 80 | Cg3 | fSms | ein-koh | 1 | 10YR3/1 | 1 | | 0 | 0 | + | LD01-8058 |
| 6 | 80 | | Cgf | | | | | | | | | | |

Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 13 of 29

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 13 | **geogr. latitude:** | 72°22.530' N | **profile type:** | small pit | **permafrost depth (cm):** | 87 | **date:** | 10.08.01 |
| **profile ID:** | LD01-L-02 | **geogr. longitude:** | 126°28.187' E | **profile depth (cm):** | 87 | **water level (cm):** | | **editor:** | Kutzbach |
| **location:** | Samoylov | **elevation a.s.l. (m)** | 8 | **relief:** | floodplain, low rise | | | | |
| **substrate:** | layered fluviatile sands, mud-layers, eolian sands? | | | **microrelief:** | | | | | |

**vegetation:** Hedysyarum alp., Oxytropis sp., Polygonum vivip., Castilleja septentr., Koeleria asiati., Armeria maritima, Rumex sp., Parnassia palustris, Salix glauca, Saxifraga hirculus, Dryε

**Soil Tax.:** Typic Psammorthel **WRB:** Areni-Fluvic Cryosol ar-fv CR **Jelovskaya:** Permafrost Alluvial Turfness

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 87 | | Cf | fSms | | | 10YR4/2 | | | | | | |
| 1 | 0 | 7 | A | fSl2 | (kru) (sods) | 1 | 10YR3/2 | 3-4 | | 5 | 0 | - | LD01-8061 |
| 2 | 7 | 25 | C/Ab1 | fSms+fSu2 | ein+sub | 1 | 10YR5/2+10YR4/2 | 1+3 | | 4 | 0 | - | LD01-8062 |
| 3 | 25 | 63 | C/Ab2 | fSms+fSu2 | ein+sub | 1 | 10YR6/3 | 1+3 | | 1 | 0 | - | LD01-8063 |
| 4 | 63 | 87 | C/Ab3 | fSms+fSu2 | ein+sub | 2 | 10YR3/2 | 2 | | 0 | 0 | - | LD01-8064 |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 14 of 29**

**serial no.:** 14 **geogr. latitude:** 72°22.924' N **profile type:** small pit **permafrost depth (cm):** 30 **date:** 11.08.01

**profile ID:** LD01-L-03 **geogr. longitude:** 126°28.370' E **profile depth (cm):** 30 **water level (cm):** 7 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 7 **relief:** floodplain, depression in front of bluff of 1. main terrace

**substrate:** moss- and sedge peat **microrelief:**

**vegetation:** Carex caespitosa, Eriophorum angustifolium, Agrostis stolonifera, mosses

**Soil Tax.:** Fluvaquentic Fibristel **WRB:** Gleyi-Cryic Histosol (Fibri-Fluvic) gl-cy HS (fi-fv) **Jelovskaya:** Permafrost Alluvial Muddy-Peat-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 15 | Oi | - (U) | - | - | 10YR2/2 | 7 | 2 | 6 | 0 | - | LD01-8067 |
| 2 | 15 | 30 | Oi | - | - | - | 10YR2/2 | 7 | 1 | 5 | 0 | + | LD01-8068 |
| 3 | 30 | | Of | | | | | | | | | | |

Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 15 of 29

**serial no.:** 15 **geogr. latitude:** 72°22.733' N **profile type:** small pit **permafrost depth (cm):** 45 **date:** 11.08.01

**profile ID:** LD01-L-04 **geogr. longitude:** 126°28.369' E **profile depth (cm):** 45 **water level (cm):** 15 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 7,5 **relief:** floodplain, depression in front of bluff of 1. main terrace

**substrate:** layered fluviatile sands and silts peat layers **microrelief:** low moss-hillocks

**vegetation:** Salix glauca, Equisetum arvense, Equisetum variegatum, Carex aquatilis, mosses

**Soil Tax.:** Ruptic-Histic Aquorthel **WRB:** Gleyi-Histic Cryosol (Fluvi-Fibric) gl-hi CR (fv-fi) **Jelovskaya:** Permafrost Alluvial Muddy-Peatish-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 8 | Oi | - (U) | - | 1 | 10YR4/1 | 7 | 2 | 1 | 0 | - | LD01-8071 |
| 2 | 8 | 20 | Bg1 | fS+U | koh | 1 | 10Yr3/2 | 6 | | 5 | 15 | - | LD01-8072 |
| 3 | 20 | 33 | Bg2 | fS+U | koh | 1 | 10YR4/1 | 6 | | 2 | 0 | + | LD01-8073 |
| 4 | 33 | 45 | Bg3 | mSfs | koh | 1 | 2,5YR2/1 | 4 | | 0 | 0 | + | LD01-8074 |
| 5 | 45 | | Bgf | | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 16 | **geogr. latitude:** | 72°22.535' N | **profile type:** | small pit | **permafrost depth (cm):** | 47 | **date:** | 26.08.01 |
| **profile ID:** | LD01-L-10 | **geogr. longitude:** | 126°28.679' E | **profile depth (cm):** | 47 | **water level (cm):** | 40 | **editor:** | Kutzbach |
| **location:** | Samoylov | **elevation a.s.l. (m)** | 10 | **relief:** | floodplain: "High-floodplain", close to slope | | | | |
| **substrate:** | fluviatile sands | | | **microrelief:** | centre of low-centred polygon, weak microrelief | | | | |
| **vegetation:** | Carex aquatilis, Dryas punctata, Astragalus umbellatus, Salix glauca, Lagotis glauca, Luzula sp., Polygonum viviparum, Arctous erythrocarpus, mosses, lichens | | | | | | | | |

**Soil Tax.:** Psammentic Aquorthel **WRB:** Fluvi-Gleyic Cryosol (Arenic) fv-gl CR (ar) **Jelovskaya:** Permafrost Alluvial Turfness Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 2 | Oi | | | 1 | | 7 | 1 | 0 | 0 | - | LD01-8223 |
| 2 | 2 | 9 | A | fSl2 | ein-kru | 1 | | 4 | | 4 | 0 | - | LD01-8224 |
| 3 | 9 | 33 | Bg/Ab1 | mSfs+fSl2 | ein+sub | 1 | | 1+3 | | 3 | 10 | - | LD01-8225 |
| 4 | 33 | 47 | Bg/Ab2 | mSfs+fSl2 | ein+sub | 1 | | 1+3 | | 1 | 10 | - | LD01-8227 |
| 5 | 47 | | Bgf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 17 of 29**

**serial no.:** 17
**profile ID:** LD01-L-06
**location:** Samoylov
**substrate:** moss- and sedge peat
**vegetation:** mosses, Carex aquatilis

**geogr. latitude:** 72°22.535' N
**geogr. longitude:** 126°28.876' E
**elevation a.s.l. (m)** 9.5

**profile type:** small pit
**profile depth (cm):** 28
**relief:** floodplain: "High-floodplain", depression
**microrelief:** centre of low-centred polygon, weak microrelief

**permafrost depth (cm):** 28
**water level (cm):** 7

**date:** 14.08.01
**editor:** Kutzbach

**Soil Tax.:** Fluvaquentic Fibristel **WRB:** Gleyi-Cryic Histosol (Fibric) gl-cy HS (fi) **Jelovskaya:** Permafrost Peat-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 12 | Oi1 | | | 1 | 7,5YR2/2 | 7 | 2 | 5 | 0 | - | LD01-8086 |
| 2 | 12 | 28 | Oi2 | | | 1 | 7,5YR4-2 | 7 | 1 | 5 | 0 | + | LD01-8087 |
| 3 | 28 | | Of | | | | | | | | | | |

Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 18 of 29

**serial no.:** 18 **geogr. latitude:** 72°22.537' N **profile type:** small pit **permafrost depth (cm):** 32 **date:** 14.08.01

**profile ID:** LD01-L-07 **geogr. longitude:** 126°29.021 E **profile depth (cm):** 32 **water level (cm):** 25 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 11 **relief:** 1. main terrace, delta terrace, gently inclined, slope step-like due to polygonal ground

**substrate:** shallow autochthonous moss peat above fluviatile sands above peat **microrelief:** rim of low-centred polygon

**vegetation:** Hylocomium splendens, Carex aquatilis, Dryas punctata, Salix glauca

**Soil Tax.:** Glacic Aquturbel **WRB:** Gleyi-Histic Cryosol (Fibri-Glacic) gl-hi CR (fi-gc) **Jelovskaya:** Permafrost Peatish Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 10 | Oi | | | 1 | 5YR2/2 | 7 | 2 | 5 | 0 | - | LD01-8088 |
| 2 | 11 | 14 | Bg1 | fSl2 | koh | 1 | 10YR3/1 | 3 | | 4 | 40 | - | LD01-8089 |
| 3 | 14 | 24 | Bg2 | fSl2 | koh | 1 | 10YR3/1 | 2 | | 4 | 0 | + | LD01-8090 |
| 4 | 24 | 32 | Bg3 | Slu | koh | 1 | 10YR3/1 | 2 | | 2 | 0 | + | LD01-8091 |
| 5 | 32 | | Bgf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 19 of 29**

**serial no.:** 19 **geogr. latitude:** 72°22.540' N **profile type:** small pit **permafrost depth (cm):** 37 **date:** 14.08.01

**profile ID:** LD01-L-08 **geogr. longitude:** 126°29.015' E **profile depth (cm):** 37 **water level (cm):** 5 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 11 **relief:** 1. main terrace, delta terrace, gently inclined, slope step-like due to polygonal ground

**substrate:** moss peat **microrelief:** centre of low-centred polygon

**vegetation:** mosses, Carex aquatilis, Pedicularis sp., Caltha palustris

**Soil Tax.:** Typic Historthel **WRB:** Gleyi-Cryic Histosol (Fibric) gl-cy HS (fi) **Jelovskaya:** Permafrost Peat-Gley

| horizon number | npper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 12 | Oi1 | | | | 2,5YR2/1 | 7 | 2 | 5 | 0 | - | LD01-8092 |
| 2 | 12 | 37 | Oi2 | | | | 2,5YR6/8 | 7 | 1 | 5 | 0 | + | LD01-8093 |
| 3 | 37 | | Oif | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 20 of 29**

**serial no.:** 20 **geogr. latitude:** 72°23.100' N **profile type:** small pit **permafrost depth (cm):** 63 **date:** 22.08.01

**profile ID:** LD01-L-09 **geogr. longitude:** 126°28.935' E **profile depth (cm):** 63 **water level (cm):** 46 **editor:** Kutzbach

**location:** Samoylov **elevation a.s.l. (m)** 5 **relief:** floodplain, depression in front of bluff of 1. main terrace

**substrate:** fluviatile silts **microrelief:**

**vegetation:** Carex caespitosa, Poa vivipara, Eriophorum angustifolium

**Soil Tax.:** Typic Aquorthel **WRB:** Fluvi-Gleyic Cryosol fv-gl CR **Jelovskaya:** Permafrost Alluvial Layered Poorly Developed (Primitive) Muddy

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 15 | A | Lu | koh | 1 | 10YR3/2 | 5-6 | | 5 | 0 | - | LD01-8094 |
| 2 | 15 | 29 | B | Lu | koh | 1 | 10YR3/2 | 5 | | 4 | 0 | - | LD01-8095 |
| 3 | 29 | 32 | Bg1 | gS | ein | 1 | 2,5Y4/2 | 1 | | 3 | 50 | - | |
| 4 | 32 | 45 | Bg2 | Lu | koh | 1 | 5Y4/1 | 3 | | 3 | 40 | + | LD01-8096 |
| 5 | 45 | 63 | Bg3 | fSu4 | koh | 1 | 5Y4/1 | 3 | | 3 | 40 | + | LD01-8097 |
| 6 | 63 | | Bgf | | | | | | | | | | |

Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 21 of 29

**serial no.:** 21 **geogr. latitude:** 72°21.306' N **profile type:** small pit **permafrost depth (cm):** 70 **date:** 17.08.01

**profile ID:** LD01-K-01 **geogr. longitude:** 126°12.825' E **profile depth (cm):** 70 **water level (cm):** **editor:** Kutzbach

**location:** Kurungnakh **elevation a.s.l. (m)** 50 **relief:** at the summit of a pingo, steep slope, alas on the 3. main terrace (ice complex)

**substrate:** fluviatile silts, alas deposits **microrelief:**

**vegetation:** Salix glauca, Astragalus umbellatus

**Soil Tax.:** Typic Aquiturbel **WRB:** Gleyi-Turbic Cryosol gl-tu CR **Jelovskaya:** Permafrost Tundra Kryoturbit ?

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 7 | A | Uls | kru | 1 | 10YR3/2 | 3 | | 4 | 0 | - | LD01-8000 |
| 2 | 7 | 28 | Bjjg | Uls | sub-kru | 2 | 10YR4/2 | 2 | | 3 | 70 | - | LD01-8001 |
| 3 | 28 | 45 | Bg1 | Uls | sub-platelike(2-5mm) | 3 | 10YR3/2 | 2 | | 2 | 50 | - | LD01-8002 |
| 4 | 45 | 59 | Bg2 | Uls | sub-platelike(5-20mm) | 3 | 2,5Y3/2 | 2 | | 1 | 5 | - | LD01-8003 |
| 5 | 59 | 67 | Bg3 | Uls | sub-platelike(5-20mm) | 3 | 2,5YR3/2 | 2 | | 1 | 50 | - | LD01-8004 |
| 6 | 67 | 70 | Bgh | Uls | koh | 3 | 10YR2/1 | 3-4 | | 1 | 50 | - | LD01-8005 |
| 7 | 70 | | Bgf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 22 of 29**

**serial no.:** 22 **geogr. latitude:** 72°21.216' N **profile type:** small pit **permafrost depth (cm):** 40 **date:** 17.08.01

**profile ID:** LD01-K-02 **geogr. longitude:** 126°13.333' E **profile depth (cm):** 40 **water level (cm):** 1 **editor:** Kutzbach

**location:** Kurungnakh **elevation a.s.l. (m)** 25 **relief:** alas depression on the 3. main terrace (ice complex)

**substrate:** autochthonous moss peat above fluviatile silts (alas) **microrelief:** centre of low-centred polygon

**vegetation:** Potentilla palustris, Carex aquatilis, Aulacomnium spec., Sphagnum spec.

**Soil Tax.:** Typic Hemistel **WRB:** Gleyi-Cryic Histosol gl-cy HS **Jelovskaya:** Permafrost Peat-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 5 | Oi | | | | 7,5Y2,5/1 | 7 | 2 | 6 | 0 | - | LD01-8006 |
| 2 | 5 | 25 | Oe | | | | 10YR3/3 | 7 | 3 | 5 | 0 | (+) | LD01-8007 |
| 3 | 25 | 40 | Bg | Lu (-Lt3?) | | | 5GY4/1 | 1 | | 1 | 0 | + | LD01-8008 |
| 4 | 40 | | Bgf | | | | | | | | | | |

Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 23 of 29

**serial no.:** 23 | **geogr. latitude:** 72°21.216' N | **profile type:** small pit | **permafrost depth (cm):** 24 | **date:** 17.08.01

**profile ID:** LD01-K-03 | **geogr. longitude:** 126°13.333' E | **profile depth (cm):** 24 | **water level (cm):** 20 | **editor:** Kutzbach

**location:** Kurungnakh | **elevation a.s.l. (m)** 25 | **relief:** alas depression on the 3. main terrace (ice complex)

**substrate:** autochthonous moss peat above fluviatile silts (alas) | **microrelief:** rim of low-centred polygon

**vegetation:** Carex aquatilis, Salix spec., Betula nana, mosses, lichens

**Soil Tax.:** Glacic Historthel | **WRB:** Gleyi-Histic Cryosol (Glacic) | gl-hi CR (gc) | **Jelovskaya:** Permafrost Peatish-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 9 | Oi | | | | 10YR2/1 | 7 | 2 | 2-3 | 0 | - | LD01-8009 |
| 2 | 9 | 19 | Oe | | | 1 | 10YR2/2 | 7 | 3-4 | 3 | 0 | - | LD01-8010 |
| 3 | 19 | 24 | Bg | Tu3 | koh-platelike | 2 | 2,5Y4/1 | 1 | | 0 | 15 | - | LD01-8011 |
| 4 | 24 | | Wf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 24 of 29**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 24 | **geogr. latitude:** | 72°20.102' N | **profile type:** | small pit | **permafrost depth (cm):** | 27 | **date:** | 20.08.01 |
| **profile ID:** | LD01-K-04 | **geogr. longitude:** | 126°16.927' E | **profile depth (cm):** | 27 | **water level (cm):** | 2 | **editor:** | Kutzbach |
| **location:** | Kurungnakh | **elevation a.s.l. (m)** | 40 | **relief:** | 3. main terrace (ice complex), gently inclined | | | | |
| **substrate:** | moss- and sedge peat | | | **microrelief:** | centre of low-centred polygon, weak microrelief | | | | |
| **vegetation:** | Carex aquatilis, Potentilla palustris, mosses | | | | | | | | |

**Soil Tax.:** Typic Hemistel **WRB:** Gleyi-Cryic Histosol gl-cy HS **Jelovskaya:** Permafrost Peat-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 12 | Oi | | | | 5YR2,5/1 | 7 | 2 | 5 | 0 | - | LD01-8012 |
| 2 | 12 | 27 | Oe | | | | 10YR3/2 | 7 | 3-4 | 3 | 0 | - | LD01-8013 |
| 3 | 27 | | Oef | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 25 of 29**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **serial no.:** | 25 | **geogr. latitude:** | 72°20.102' N | **profile type:** | small pit | **permafrost depth (cm):** | 25 | **date:** | 20.08.01 |
| **profile ID:** | LD01-K-05 | **geogr. longitude:** | 126°16.927' E | **profile depth (cm):** | 32 | **water level (cm):** | 20 | **editor:** | Kutzbach |
| **location:** | Kurungnakh | **elevation a.s.l. (m)** | 40 | **relief:** | 3. main terrace (ice complex), gently inclined | | | | |
| **substrate:** | shallow moss peat abov fluviatile silts | | | **microrelief:** | rim of low-centred polygon, weak microrelief | | | | |
| **vegetation:** | Carex aquatilis, Salix reptans, Betula nana, Poa spec., Hylocomium splendens | | | | | | | | |

**Soil Tax.:** Glacic Historthel **WRB:** Gleyi-Histic Cryosol (Glacic) gl-hi CR (gc) **Jelovskaya:** Permafrost Peatish-Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 6 | Oi | | | | 5YR2,5/2 | 7 | 2 | 2 | 0 | - | LD01-8014 |
| 2 | 6 | 12 | Oe | | | 1 | 2,5YR3/3 | 7 | 4 | 5 | 0 | - | LD01-8015 |
| 3 | 12 | 21 | Oe | | | 1 | 7,5YR3/1 | 7 | 4 | 2 | 90 | - | LD01-8016 |
| 4 | 21 | 25 | Bg | Lt3 | koh | 1 | 5GY5/1 | 1 | | 0 | 5 | + | LD01-8017 |
| 5 | 25 | 32 | Wf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 26 of 29**

**serial no.:** 26 **geogr. latitude:** 73°31.766' N **profile type:** small pit **permafrost depth (cm):** 70 **date:** 29.07.01

**profile ID:** LD01-A-01 **geogr. longitude:** 123°25.309 E **profile depth (cm):** 70 **water level (cm):** **editor:** Kutzbach

**location:** Sanga-Dzhie SDS2 **elevation a.s.l. (m)** 20 **relief:** 2. main terrace, shoulder of a low rise, slope in direction erosional channel, inclination about. 6 %

**substrate:** eolian sands, kryoturbated **microrelief:** polygonal unsorted net

**vegetation:** Cassiope tetragona, Salix nummularia, Ochrolechia frigida, Andreaea rupestris

**Soil Tax.:** Psammentic Aquiturbel **WRB:** Gleyi-Turbic Cryosol (Arenic) gl-tu CR (ar) **Jelovskaya:** Permafrost Tundra Brown Soil, Kryoturbit

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 7 | Ajj | fSms | kru-sub | 1 | 10YR3/3 | 3 | | 5 | 0 | - | LD01-8029 |
| 2 | 7 | 29 | Bjj1 | fSms | sub-ein | 2 | 10YR4/6 | 1 | | 4 | 0 | - | LD01-8030 |
| 3 | 29 | 47 | AbBgjj | fSms | sub | 3 | 10YR3/3 | 3 | | 3 | 10 | - | LD01-8032 |
| 4 | 47 | 70 | Bjj2 | fSms | koh | 2 | 10YR4/3 | 1 | | 0 | 30 | + | LD01-8033 |
| 5 | 70 | | Bjjgf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 27 of 29**

**serial no.:** 27 **geogr. latitude:** 73°31.735' N **profile type:** small pit **permafrost depth (cm):** 35 **date:** 31.07.01

**profile ID:** LD01-A-02 **geogr. longitude:** 123°25.606' E **profile depth (cm):** 35 **water level (cm):** 10 **editor:** Kutzbach

**location:** Sanga-Dzhie SDS1 **elevation a.s.l. (m)** 18 **relief:** 2. main terrace, summit surface of low rise, very gently inclined

**substrate:** shallow moss- and sedge peat above eolian sands, kryoturbated **microrelief:** centre of low-centred polygon, weak microrelief

**vegetation:** Carex aquatilis, Eriophorum scheuchzeri, Dupontia fisheri, Cassiope tetragona, Siphula ceratites, Oncophorus wahlenbergii, Andreaea rupestris

**Soil Tax.:** Typic Histoturbel **WRB:** Gleyi-Histic Cryosol (Turbic) gl-hi CR (tu) **Jelovskaya:** Permafrost Humus Gley

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 5 | Oe1 | -(fS) | | 1 | 7,5YR2/2 | 7 | 3 | 6 | 0 | - | LD01-8035 |
| 2 | 5 | 13 | Oe2 | -(fS) | | 2 | 7,5YR4/4 | 7 | 3 | 6 | 0 | + | LD01-8036 |
| 3 | 13 | 20 | Bg | fS | koh | 2 | 7,5YR4/2 | 6 | 3 | 5 | 0 | + | LD01-8037 |
| 4 | 20 | 35 | Ajjb/Bjjg | fS+fSms | koh | 3+2 | 7,5YR2/2+7,5YR2/3 | 6+3 | | 5+3 | 0 | + | LD01-8038 |
| 5 | 35 | | Bgf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 28 of 29**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **serial no.:** | 28 | **geogr. latitude:** | 73°32.077' N | **profile type:** low bluff | **permafrost depth (cm):** 120 | **date:** | 01.08.01 |
| **profile ID:** | LD01-A-03 | **geogr. longitude:** | 123°26.392' E | **profile depth (cm):** 120 | **water level (cm):** | **editor:** | Kutzbach |
| **location:** | Sanga-Dzhie SDS3 | **elevation a.s.l. (m)** | 20 | **relief:** 2. main terrace, summit surface of low risee, low bluff (aeolian erosion) | | | |
| **substrate:** | eolian sands | | | **microrelief:** | | | |
| **vegetation:** | Salix spec., sparse vegetation | | | | | | |

**Soil Tax.:** Typic Psammoturbel **WRB:** Areni-Turbic Cryosol gl-tu CR (ar) **Jelovskaya:** Permafrost Tundra Brown Soil, Podzol-like

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 10 | CAi | fS | ein | 2 | 10YR4/4 | 1 | | 3 | 0 | - | LD01-8040 |
| 2 | 10 | 33 | C | fS | ein | 2 | 10YR4/4 | 1 | | 3 | 0 | - | LD01-8041 |
| 3 | 33 | 37 | Bjj-Ajjb1 | fS | ein-sub | 1-2 | 10YR3/3 | 2 | | 1 | 5-10 | - | LD01-8042 |
| 4 | 37 | 46 | Bjj-Ajjb2 | fS | ein-sub | 1-2 | 10YR4/4 | 1 | | 1 | 5-10 | - | LD01-8043 |
| 5 | 46 | 76 | Bjj | fS | sub-ein | 1 | 10YR4/4 | 1 | | 0 | 30 | - | LD01-8044 |
| 6 | 76 | 120 | C | fS | ein-sub | 1 | 10YR5/4 | 1 | | 0 | 0 | - | LD01-8045 |
| 7 | 120 | | Wf | | | | | | | | | | |

**Table Collection A3-2: Soil Profile Descriptions, Expedition Lena Delta 2001; page 29 of 29**

**serial no.:** 29 **geogr. latitude:** 73°34.512' N **profile type:** bluff **permafrost depth (cm):** 90 **date:** 02.08.01

**profile ID:** LD01-A-04 **geogr. longitude:** 123°21.815' E **profile depth (cm):** 320 **water level (cm):** **editor:** Kutzbach

**location:** Sanga-Dzhie SDS4 **elevation a.s.l. (m)** 10 **relief:** 2. main terrace, summit surface of low risee, high bluff (marine erosion)

**substrate:** eolian sands above fluviatile sands **microrelief:**

**vegetation:**

**Soil Tax.:** Typic Psammorthel **WRB:** Arenic Cryosol ar CR **Jelovskaya:** ?

| horizon number | upper border (cm) | lower border (cm) | symbol Soil Tax [1] | texture [2] | structure [2] | soil density [2] | colour [2] | humus content [2] (h_) | peat decomp. [2] (z_) | root density [2] (w_) | redox concentr. [2] (%) | dipyridil test [1] | sample number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 30 | Ai/C | fS | ein | 1 | | 2 | 2 | 3 | 0 | - | LD01-8047 |
| 2 | 30 | 60 | C/Ab | fS | ein-sub | 2 | | 4 | 3 | 2 | 0 | - | LD01-8048 |
| 3 | 60 | 90 | Bg-Ab | fS | ein-sub | 0 | | 4 | 3 | 1 | 0 | + | |
| 4 | 90 | 160 | Bgf | fS | | | | 4 | 3 | | 0 | + | LD01-8049 |
| 5 | 160 | 170 | OebBgf | fS | | | | 7 | 3 | | 0 | + | LD01-8050 |
| 6 | 170 | 190 | Abf/Wf | fS | | | | 6 | 3 | | 0 | + | LD01-8051 |
| 7 | 190 | 240 | AbBgf | fS | | | | 6 | 3 | | 0 | + | LD01-8052 |
| 8 | 240 | 320 | Bgf | fS | | | | 1 | | | 30-50 | + | LD01-8053 |

**Table A3-3: *Classification of soils of Samoylov Island.* According to L.G. Jelovskaya, 1987. Compiled and modified by Anna Kurchatova in August 2001.**

| Section | Subsection | Type | Subtype | Main Horizons |
|---|---|---|---|---|
| Poorly Developed (Primitive) | Primitive Alluvial | Permafrost Alluvial Layered Poorly Developed (Primitive) | Permafrost Alluvial Layered Primitive Sandy | (A)-C1-C2-⊥C3 |
| | | | Permafrost Alluvial Layered Primitive Muddy | (A)-C1-C2-⊥C3 |
| Alluvial | Alluvial Typical | Permafrost Alluvial Peat Gley | Permafrost Alluvial Muddy Peat Gley | Tv-T2-T3-Cn-⊥G |
| | | | Permafrost Alluvial Muddy Peatish Gley | Tv-AT-Bg-Cn-⊥Cg |
| | | Permafrost Alluvial Turfness | Permafrost Alluvial Turfness Gley | Av-AB-B-⊥Cg |
| | | | Permafrost Alluvial Turfness | Av-AB-B-⊥C |
| Permafrost Kryoturbit | Permafrost Kryoturbit Deformated Profile | Tundra Suprapermafrost Gley | Tundra Suprapermafrost Gley | Ov-A-Bkr-B |
| | | | Tundra Peatish Decay Gley | Otv-T2h-Bkrg-BCgkr-⊥C |
| | | Permafrost Tundra Kryoturbit | Permafrost Tundra Kryoturbit | A(AO)-BOkr-BCkr-⊥BC |
| Gley | Humus Gley | Permafrost Peat Gley | Permafrost Peat Gley | TvT2(T3)-BgC-⊥G |
| | | | Permafrost Peatish Gley | TvT1(T3)-BgG-⊥G |
| | | Permafrost Turfness Gley | Permafrost Turfness Gley | Aov-A-Bg-Cg-⊥Cg |

A = humus

B = Illuvial

G = Gley

C = Mineral base

Organic horizons: $\geq$ 70 % by volume differently decomposed organic matter
$\geq$ 35 % by weight

O = organic layer accumulated for a short time of wet conditions

T = organic layer accumulated in wet conditions

T1 = poorly decomposed peat

T2 = middle decomposed peat

T3 = strongly/ completely decomposed peat

AO = coarse humus horizon / humus 10-35 % / mixture with mineral part easily separated from mineral horizons

Other symbols:
v = alive precees of plants, roots, moos , lichens $\geq$50% by volume

kr = kryoturbation

g = traces of gley influence

⊥ = permafrost

h = illuvial humus / + traces of FeO-accumulation

**Table A3-4: Characteristics of soil subtypes in Table A3-3 (according to Jelovskaya 1987).**

1. Permafrost Alluvial Layered Primitive
   1. Geomorphological position: low flooding plain (every year flooding)
   2. Mineral composition: sandy
   3. (A)-C1-C2-⊥C3
   4. humus: 0,3 – 0,5 %
   5. pH: 6-7

2. Permafrost Alluvial Muddy-Peat Gley
   1. Depressions of high flood plain (episodic flooding)
   2. peat: 20 – 50 cm thickness
   3. Tv-T2-T3-Gn-⊥C
   4. not completely decomposed peat
   5. pH: 5-6
   6. active layer < 40-50 cm

3. Permafrost Alluvial Muddy Peatish Gley
   1. Depressions of the flood plain
   2. peat < 20 cm / 8-12 cm
   3. Tv-AT-Bg-Gn-⊥Cg
   4. decomposed peat
   5. pH: 5-6
   6. active layer: 40-50 cm

4. Permafrost Alluvial Turfness Gley
   1. Depressions of the middle and high flood plain
   2. loam
   3. Av-AB-B-⊥Cg
   4. humus: 10-12% - 5-6%; C/N=10-18
   5. ph: 6-7
   6. active layer: 50-60cm

5. Permafrost Alluvial Turfness
   1. Dry areas of high flood plain (episodic flooding)
   2. loam
   3. Av-AB-B-⊥C
   4. density : 18-20 kg/cm
   5. humus: 4-10% (top) to 0,4-0,7% (3-4%) (bottom)
   6. pH: <6
   7. active layer: 1,3-1,4 m

6. Tundra suprapermafrost gley
   1. wet centre of polygon
   2. loam
   3. Ov-A-Bkr-Bgkr-⊥Bg
   4. humus: 3-4% (1,5-8%)
   5. ph: 4-5
   6. active layer: 30-40 cm (up to 50-75 cm)

**Table A3-4: Continuation**

7. Tundra Peatish Decay Gley
   1. edges of polygons
   2. loam
   3. Otv-T2n-Bkrg-BC-⊥C
   4. humus: 1,5-4,8%
   5. pH: 4-5
   6. active layer: 50 cm

8. Permafrost Tundra Kryoturbit
   1. Drained slopes
   2. loam
   3. A(AO)-BOkr-BCkr-⊥BC
   4. humus: 4-10% (top) to 2-2,5% (bottom)
   5. pH 4-6; 6-7
   6. active layer: 50-70 cm

9. Permafrost Peat Gley
   1. wet polygons, thermokarst depressions
   2. peat: 20-50 cm
   3. Tv-T2(T3)-G-⊥C
   4. humus: 4,5-6,8 %
   5. pH 5,1-5,6
   6. active layer: 40-60 cm

10. Permafrost Peatish Gley
    1. moist polygons
    2. peat < 20 cm
    3. Tv-T2(T3)-BgG-⊥G
    4. decomposed peat < 25%
    5. pH:6-7
    6. active layer 40-60cm

11. Permafrost Turfness Gley
    1. episodic moist conditions
    2. turf
    3. Aov-A-Bg-Cg-⊥Cg
    4. humus: Aov: 12-18%
       A: 7%
       Bg: 3-4%
       Cg: 1-2%
    5. pH: top: 7, bottom 8
    6. active layer: 90-95 cm

Table A3-5 (page 1): List of soil and plant samples (total amount = 196), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 1 | LD01-6653 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 0-5 | soil physics[1], soil chemistry[2], microbiological[3], molecularbiological[4] |
| 2 | LD01-6654 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 5-10 | soil physics[1], soil chemistry, microbiological, molecularbiological |
| 3 | LD01-6655 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 10-17 | soil physics, soil chemistry, microbiological, molecularbiological |
| 4 | LD01-6656 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 17-20 | soil physics, soil chemistry, microbiological, molecularbiological |
| 5 | LD01-6657 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 20-23 | soil physics, soil chemistry, microbiological, molecularbiological |
| 6 | LD01-6658 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 23-30 | soil physics, soil chemistry, microbiological, molecularbiological |
| 7 | LD01-6659 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 30-35 | soil physics, soil chemistry, microbiological, molecularbiological |
| 8 | LD01-6660 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 35-40 | soil physics, soil chemistry, microbiological, molecularbiological |
| 9 | LD01-6661 | 23.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-03 | 40-45 | soil physics, soil chemistry, microbiological, molecularbiological |
| 10 | LD01-6662 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygonborder, P-02 | 0-7 | soil physics, soil chemistry, microbiological, molecularbiological |
| 11 | LD01-6663 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-02 | 7-13 | soil physics, soil chemistry, microbiological, molecularbiological |
| 12 | LD01-6664 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygonborder, P-02 | 13-18 | soil physics, soil chemistry, microbiological, molecularbiological |
| 13 | LD01-6665 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-02 | 18-32 | soil physics, soil chemistry, microbiological, molecularbiological |
| 14 | LD01-6666 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygonborder, P-02 | 32-38 | soil physics, soil chemistry, microbiological, molecularbiological |
| 15 | LD01-6667 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, polygoncentre, P-02 | 38-45 | soil physics, soil chemistry, microbiological, molecularbiological |
| 16 | LD01-6668 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 0-5 | soil physics, soil chemistry, microbiological, molecularbiological |
| 17 | LD01-6669 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 5-12 | soil physics, soil chemistry, microbiological, molecularbiological |
| 18 | LD01-6570 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 12-20 | soil physics, soil chemistry, microbiological, molecularbiological |
| 19 | LD01-6671 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 20-27 | soil physics, soil chemistry, microbiological, molecularbiological |
| 20 | LD01-6672 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 27-36 | soil physics, soil chemistry, microbiological, molecularbiological |
| 21 | LD01-6673 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 35-42 | soil physics, soil chemistry, microbiological, molecularbiological |
| 22 | LD01-6674 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, top of polygonborder, P-01 | 42-49 | soil physics, soil chemistry, microbiological, molecularbiological |
| 23 | LD01-6675 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, frost crack | 0-5 | microbiological |
| 24 | LD01-6676 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 50 cm beneath the frost crack | 0-5 | microbiological |
| 25 | LD01-6677 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 100 cm beneath the frost crack | 0-5 | microbiological |
| 26 | LD01-6678 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 150 cm beneath the frost crack | 0-5 | microbiological |
| 27 | LD01-6679 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 200 cm beneath the frost crack | 0-5 | microbiological |
| 28 | LD01-6680 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 250 cm beneath the frost crack | 0-5 | microbiological |
| 29 | LD01-6681 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 300 cm beneath the frost crack | 0-5 | microbiological |
| 30 | LD01-6682 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 400 cm beneath the frost crack | 0-5 | microbiological |
| 31 | LD01-6683 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, 500cm beneath the frost crack | 0-5 | microbiological |
| 32 | LD01-6684 | 24.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | soil sample, layer of Fe-mineral | 13 | microbiological |
| 33 | LD01-8000 | 17.08.01 | Kurungnakh 72°21.306' N 126°12.825' E | soil sample, pingo, K-01 | 0-7 | soil physics, soil chemistry |
| 34 | LD01-8001 | 17.08.01 | Kurungnakh 72°21.306' N 126°12.825' E | soil sample, pingo, K-01 | 7-28 | soil physics, soil chemistry |
| 35 | LD01-8002 | 17.08.01 | Kurungnakh 72°21.306' N 126°12.825' E | soil sample, pingo, K-01 | 28-45 | soil physics, soil chemistry |
| 36 | LD01-8003 | 17.08.01 | Kurungnakh 72°21.306' N 126°12.825' E | soil sample, pingo, K-01 | 45-59 | soil physics, soil chemistry |
| 37 | LD01-8004 | 17.08.01 | Kurungnakh 72°21.306' N 126°12.825' E | soil sample, pingo, K-01 | 59-67 | soil physics, soil chemistry |
| 38 | LD01-8005 | 17.08.01 | Kurungnakh 72°21.306' N 126°12.825' E | soil sample, pingo, K-01 | 67-70 | soil physics, soil chemistry |
| 39 | LD01-8006 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | soil sample, polygoncentre, K-02 | 0-5 | soil physics, soil chemistry, microbiological, molecularbiological |
| 40 | LD01-8007 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | soil sample, polygoncentre, K-02 | 5-25 | soil physics, soil chemistry, microbiological, molecularbiological |
| 41 | LD01-8008 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | soil sample, polygoncentre, K-02 | 25-40 | soil physics, soil chemistry, microbiological, molecularbiological |
| 42 | LD01-8009 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | soil sample, polygonborder, K-03 | 0-9 | soil physics, soil chemistry, microbiological, molecularbiological |
| 43 | LD01-8010 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | soil sample, polygonborder, K-03 | 9-19 | soil physics, soil chemistry, microbiological, molecularbiological |
| 44 | LD01-8011 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | soil sample, polygonborder, K-03 | 19-24 | soil physics, soil chemistry, microbiological, molecularbiological |
| 45 | LD01-8012 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | soil sample, polygoncentre, K-04 | 0-12 | soil physics, soil chemistry, microbiological, molecularbiological |
| 46 | LD01-8013 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | soil sample, polygoncentre, K-04 | 12-27 | soil physics, soil chemistry, microbiological, molecularbiological |
| 47 | LD01-8014 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | soil sample, polygpnborder, K-05 | 0-6 | soil physics, soil chemistry, microbiological, molecularbiological |

Table A3-5 (page 2): List of soil and plant samples (total amount = 196), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 48 | LD01-8015 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | soil sample, polygpnborder, K-05 | 6-12 | soil physics, soil chemistry, microbiological, molecularbiological |
| 49 | LD01-8016 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | soil sample, polygpnborder, K-05 | 12-21 | soil physics, soil chemistry, microbiological, molecularbiological |
| 50 | LD01-8017 | 20.08.01 | Kurungnakh 72°20,102' N 126°16,927' E | soil sample, polygpnborder, K-05 | 21-25 | soil physics, soil chemistry, microbiological, molecularbiological |
| 51 | LD01-8018 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, S-01 | 0-3 | soil physics, soil chemistry |
| 52 | LD01-8019 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, S-01 | 3-9 | soil physics, soil chemistry |
| 53 | LD01-8020 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, S-01 | 9-10 | soil physics, soil chemistry |
| 54 | LD01-8021 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, S-01 | 10-20 | soil physics, soil chemistry |
| 55 | LD01-8022 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, S-01 | 20-35 | soil physics, soil chemistry |
| 56 | LD01-8023 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, pooled sample, S-01 | 0-10 | soil organic matter[5] |
| 57 | LD01-8024 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygonborder, pooled sample, S-01 | 10-35 | soil organic matter |
| 58 | LD01-8025 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygoncentre, S-02 | 0-2 | soil physics, soil chemistry |
| 59 | LD01-8026 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygoncentre, S-02 | 2-18 | soil physics, soil chemistry |
| 60 | LD01-8027 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygoncentre, S-02 | 18-22 | soil physics, soil chemistry |
| 61 | LD01-8028 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | soil sample, polygoncentre, pooled sample, S-02 | 0-20 | soil organic matter |
| 62 | LD01-8054 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, L-01 | 0-9 | soil physics, soil chemistry, microbiological, molecularbiological |
| 63 | LD01-8055 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, L-01 | 9-17 | soil physics, soil chemistry, microbiological, molecularbiological |
| 64 | LD01-8056 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, L-01 | 17-31 | soil physics, soil chemistry, microbiological, molecularbiological |
| 65 | LD01-8057 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, L-01 | 31-40 | soil physics, soil chemistry, microbiological, molecularbiological |
| 66 | LD01-8058 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, L-01 | 40-80 | soil physics, soil chemistry, microbiological, molecularbiological |
| 67 | LD01-8059 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, pooled sample, A-Go, L-01 | | soil organic matter |
| 68 | LD01-8060 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | soil sample, vegetation area 4, pooled sample, Gr, L-01 | | soil organic matter |
| 69 | LD01-8061 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | soil sample, vegetation area 6, L-02 | 0-7 | soil physics, soil chemistry, microbiological, molecularbiological |
| 70 | LD01-8062 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | soil sample, vegetation area 6, L-02 | 7-25 | soil physics, soil chemistry, microbiological, molecularbiological |
| 71 | LD01-8063 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | soil sample, vegetation area 6, L-02 | 25-63 | soil physics, soil chemistry, microbiological, molecularbiological |
| 72 | LD01-8064 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | soil sample, vegetation area 6, L-02 | 63-87 | soil physics, soil chemistry, microbiological, molecularbiological |
| 73 | LD01-8065 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | soil sample, vegetation area 6, pooled sample, Ah, L-02 | | soil organic matter |
| 74 | LD01-8066 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | soil sample, vegetation area 6, pooled sample, Go, L-02 | | soil organic matter |
| 75 | LD01-8067 | 11.08.01 | Samoylov 72°22.924' N 126°28.370' E | soil sample, vegetation area 8, L-03 | 0-15 | soil physics, soil chemistry, microbiological, molecularbiological |
| 76 | LD01-8068 | 11.08.01 | Samoylov 72°22.924' N 126°28.370' E | soil sample, vegetation area 8, L-03 | 15-30 | soil physics, soil chemistry, microbiological, molecularbiological |
| 77 | LD01-8069 | 11.08.01 | Samoylov 72°22.924' N 126°28.370' E | soil sample, vegetation area 8, pooled sample, upper peat layer, L03 | | soil organic matter |
| 78 | LD01-8070 | 11.08.01 | Samoylov 72°22.924' N 126°28.370' E | soil sample, vegetation area 8, pooled sample, lower peat layer, L-03 | | soil organic matter |
| 79 | LD01-8071 | 11.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, L-04 | 0-8 | soil physics, soil chemistry, microbiological, molecularbiological |
| 80 | LD01-8072 | 11.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, L-04 | 8-20 | soil physics, soil chemistry, microbiological, molecularbiological |
| 81 | LD01-8073 | 11.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, L-04 | 20-33 | soil physics, soil chemistry, microbiological, molecularbiological |
| 82 | LD01-8074 | 11.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, L-04 | 33-45 | soil physics, soil chemistry, microbiological, molecularbiological |
| 83 | LD01-8075 | 22.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, pooled sample, O, L-04 | | soil organic matter |
| 84 | LD01-8076 a | 22.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, pooled sample,aerobic layer, L-04 | | soil organic matter |
| 85 | LD01-8076 b | 22.08.01 | Samoylov 72°22.733' N 126°28.369' E | soil sample, vegetation area 9, pooled sample,anaerobic layer, L-04 | | soil organic matter |
| 86 | LD01-8077 | 13.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 0-11 | soil physics, soil chemistry, microbiological, molecularbiological |
| 87 | lD01-8078 | 13.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 11-21 | soil physics, soil chemistry, microbiological, molecularbiological |
| 88 | LD01-8079 | 13.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 21-29 | soil physics, soil chemistry, microbiological, molecularbiological |
| 89 | LD01-8080 | 13.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 29-36 | soil physics, soil chemistry, microbiological, molecularbiological |
| 90 | LD01-8081 | 22.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 36-41 | soil physics, soil chemistry, microbiological, molecularbiological |
| 91 | LD01-8082 | 22.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 41-75 | soil physics, soil chemistry, microbiological, molecularbiological |
| 92 | LD01-8083 | 22.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, L-05 | 75-98 | soil physics, soil chemistry, microbiological, molecularbiological |
| 93 | LD01-8084 | 22.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, pooled sample,aerobic layer, L-05 | | soil organic matter |
| 94 | LD01-8085 | 22.08.01 | Samoylov 72°22.550' N 126°27.644' E | soil sample, vegetation area 2, pooled sample,anaerobic layer, L-05 | | soil organic matter |

Table A3-5 (page 3): List of soil and plant samples (total amount = 196), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 95 | LD01-8086 | 14.08.01 | Samoylov 72°22.535' N 126°28.876' E | soil sample, vegetation area 21, L-06 | 0-12 | soil physics, soil chemistry, microbiological, molecularbiological |
| 96 | LD01-8087 | 14.08.01 | Samoylov 72°22.535' N 126°28.876' E | soil sample, vegetation area 21, L-06 | 12-28 | soil physics, soil chemistry, microbiological, molecularbiological |
| 97 | LD01-8088 | 14.08.01 | Samoylov 72°22.537' N 126°29.021' E | soil sample, vegetation area 22, L-07 | 0-11 | soil physics, soil chemistry, microbiological, molecularbiological |
| 98 | LD01-8089 | 14.08.01 | Samoylov 72°22.537' N 126°29.021' E | soil sample, vegetation area 22, L-07 | 11-14 | soil physics, soil chemistry, microbiological, molecularbiological |
| 99 | LD01-8090 | 14.08.01 | Samoylov 72°22.537' N 126°29.021' E | soil sample, vegetation area 22, L-07 | 14-20 | soil physics, soil chemistry, microbiological, molecularbiological |
| 100 | LD01-8091 | 14.08.01 | Samoylov 72°22.537' N 126°29.021' E | soil sample, vegetation area 22, L-07 | 20-32 | soil physics, soil chemistry, microbiological, molecularbiological |
| 101 | LD01-8092 | 14.08.01 | Samoylov 72°22.540' N 126°29.015' E | soil sample, vegetation area 23, L-08 | 0-12 | soil physics, soil chemistry, microbiological, molecularbiological |
| 102 | LD01-8093 | 14.08.01 | Samoylov 72°22.540' N 126°29.015' E | soil sample, vegetation area 23, L-08 | 12-37 | soil physics, soil chemistry, microbiological, molecularbiological |
| 103 | LD01-8094 | 22.08.01 | Samoylov 72°23.100' N 126°28.935' E | soil sample, vegetation area 24, L-09 | 0-15 | soil physics, soil chemistry, microbiological, molecularbiological |
| 104 | LD01-8095 | 22.08.01 | Samoylov 72°23.100' N 126°28.935' E | soil sample, vegetation area 24, L-09 | 15-29 | soil physics, soil chemistry, microbiological, molecularbiological |
| 105 | LD01-8096 | 22.08.01 | Samoylov 72°23.100' N 126°28.935' E | soil sample, vegetation area 24, L-09 | 32-45 | soil physics, soil chemistry, microbiological, molecularbiological |
| 106 | LD01-8097 | 22.08.01 | Samoylov 72°23.100' N 126°28.935' E | soil sample, vegetation area 24, L-09 | 45-63 | soil physics, soil chemistry, microbiological, molecularbiological |
| 107 | LD01-8098 | 22.08.01 | Samoylov 72°23.100' N 126°28.935' E | soil sample, vegetation area 24, pooled sample,aerobic layer, L-09 | | soil organic matter |
| 108 | LD01-8099 | 22.08.01 | Samoylov 72°23.100' N 126°28.935' E | soil sample, vegetation area 24, pooled sample,anaerobic layer, L-09 | | soil organic matter |
| 109 | LD01-8100 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | soil sample, vegetation area 7, E-01 | 0-7 | soil physics, soil chemistry |
| 110 | LD01-8101 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | soil sample, vegetation area 7, E-01 | 7-26 | soil physics, soil chemistry |
| 111 | LD01-8102 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | soil sample, vegetation area 7, E-01 | 26-45 | soil physics, soil chemistry |
| 112 | LD01-8103 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | soil sample, vegetation area 7, E-01 | 45-73 | soil physics, soil chemistry |
| 113 | LD01-8104 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | soil sample, vegetation area 7, pooled sample, aerobic layer, E-01 | | soil organic matter |
| 114 | LD01-8105 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | soil sample, vegetation area 7, pooled sample, anaerobic layer, E-01 | | soil organic matter |
| 115 | LD01-8106 | 11.08.01 | Samoylov 72°23.242' N 126°29.548' E | soil sample, vegetation area 11, E-02 | 0-10 | soil physics, soil chemistry |
| 116 | LD01-8107 | 11.08.01 | Samoylov 72°23.242' N 126°29.548' E | soil sample, vegetation area 11, E-02 | 10-21 | soil physics, soil chemistry |
| 117 | LD01-8108 | 11.08.01 | Samoylov 72°23.242' N 126°29.548' E | soil sample, vegetation area 11, pooled sample, organic surface, E-02 | | soil organic matter |
| 118 | LD01-8109 | 11.08.01 | Samoylov 72°23.242' N 126°29.548' E | soil sample, vegetation area 11, pooled sample, aerobic layer, E-02 | | soil organic matter |
| 119 | LD01-8110 | 11.08.01 | Samoylov 72°23.113' N 126°29.971' E | soil sample, vegetation area 12, E-03 | 0-5 | soil physics, soil chemistry |
| 120 | LD01-8111 | 11.08.01 | Samoylov 72°23.113' N 126°29.971' E | soil sample, vegetation area 12, E-03 | 5-25 | soil physics, soil chemistry |
| 121 | LD01-8112 | 11.08.01 | Samoylov 72°23.113' N 126°29.971' E | soil sample, vegetation area 12, E-03 | 25-43 | soil physics, soil chemistry |
| 122 | LD01-8113 | 11.08.01 | Samoylov 72°23.113' N 126°29.971' E | soil sample, vegetation area 12, E-03 | 43-99 | soil physics, soil chemistry |
| 123 | LD01-8114 | 25.08.01 | Samoylov 72°23.113' N 126°29.971' E | soil sample, vegetation area 12, pooled sample, Ah, E-03 | | soil organic matter |
| 124 | LD01-8115 | 25.08.01 | Samoylov 72°23.113' N 126°29.971' E | soil sample, vegetation area 12, pooled sample, C, E-03 | | soil organic matter |
| 125 | LD01-8116 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygoncentre, E-04 | 0-15 | soil physics, soil chemistry |
| 126 | LD01-8117 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygoncentre, E-04 | 15-21 | soil physics, soil chemistry |
| 127 | LD01-8118 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygoncentre, E-04 | 21-28 | soil physics, soil chemistry |
| 128 | LD01-8119 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygoncentre, pooled sample, organic surface, E-04 | | soil organic matter |
| 129 | LD01-8120 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygoncentre, pooled sample, aerobic layer, E-04 | | soil organic matter |
| 130 | LD01-8121 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygonborder, E-05 | 0-8 | soil physics, soil chemistry |
| 131 | LD01-8122 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygonborder, E-05 | 8-17 | soil physics, soil chemistry |
| 132 | LD01-8123 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygonborder, E-05 | 17-28 | soil physics, soil chemistry |
| 133 | LD01-8124 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygonborder, pooled sample, organic surface, E-05 | | soil organic matter |
| 134 | LD01-8125 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | soil sample, vegetation area 13, polygonborder, pooled sample, aerobic layer, E-05 | | soil organic matter |
| 135 | LD01-8126 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygoncentre, E-06 | 0-6 | soil physics, soil chemistry |
| 136 | LD01-8127 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygoncentre, E-06 | 6-9 | soil physics, soil chemistry |
| 137 | LD01-8128 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygoncentre, E-06 | 9-16 | soil physics, soil chemistry |
| 138 | LD01-8129 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygoncentre, E-06 | 16-30 | soil physics, soil chemistry |
| 139 | LD01-8130 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygoncentre, pooled sample, organic surface, E-06 | | soil organic matter |
| 140 | LD01-8131 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygoncentre, pooled sample, aerobic layer, E-06 | | soil organic matter |
| 141 | LD01-8132 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygonborder, E-07 | 0-12 | soil physics, soil chemistry |

**Table A3-5 (page 4): List of soil and plant samples (total amount = 196), collected at central Lena Delta during the expedition Lena Delta 2001.**

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 142 | LD01-8133 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygonborder, E-07 | 12-20 | soil physics, soil chemistry |
| 143 | LD01-8134 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygonborder, E-07 | 20-26 | soil physics, soil chemistry |
| 144 | LD01-8135 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygonborder, E-07 | 26-38 | soil physics, soil chemistry |
| 145 | LD01-8136 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygonborder, pooled sample, organic surface, E-07 | | soil organic matter |
| 146 | LD01-8137 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | soil sample, vegetation area 14, polygonborder, pooled sample, aerobic layer, E-07 | | soil organic matter |
| 147 | LD01-8138 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, E-08 | 0-5 | soil physics, soil chemistry |
| 148 | LD01-8139 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, E-08 | 5-15 | soil physics, soil chemistry |
| 149 | LD01-8140 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, E-08 | 15-20 | soil physics, soil chemistry |
| 150 | LD01-8141 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, E-08 | 20-29 | soil physics, soil chemistry |
| 151 | LD01-8142 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, E-08 | 29-45 | soil physics, soil chemistry |
| 152 | LD01-8143 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, E-08 | 45-62 | soil physics, soil chemistry |
| 153 | LD01-8144 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, pooled sample, organic surface, E-08 | | soil organic matter |
| 154 | LD01-8145 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, pooled sample, aerobic layer, E-08 | | soil organic matter |
| 155 | LD01-8146 | 23.08.01 | Samoylov 72°20.217' N 126°29.515' E | soil sample, vegetation area 15, pooled sample, anaerobic layer, E-08 | | soil organic matter |
| 156 | LD01-8147 | 13.08.01 | Samoylov 72°22.550' N 126°27.644' E | plant sample, vegetation area 2 | | biomass determination |
| 157 | LD01-8148 | 10.08.01 | Samoylov 72°22.538' N 126°27.898' E | plant sample, vegetation area 4 | | biomass determination |
| 158 | LD01-8149 | 10.08.01 | Samoylov 72°22.530' N 126°28.187' E | plant sample, vegetation area 6 | | biomass determination |
| 159 | LD01-8150 | 11.08.01 | Samoylov 72° 23.280' N 126° 28.763' E | plant sample, vegetation area 7 | | biomass determination |
| 160 | LD01-8151 | 26.08.01 | Samoylov 72°22.924' N 126°28.370' E | plant sample, vegetation area 8 | | biomass determination |
| 161 | LD01-8152 | 11.08.01 | Samoylov 72°22.733' N 126°28.369' E | plant sample, vegetation area 9 | | biomass determination |
| 162 | LD01-8153 | 08.08.01 | Samoylov 72°22.535' N 126°28.679' E | plant sample, vegetation area 10 | | biomass determination |
| 163 | LD01-8154 | 11.08.01 | Samoylov 72°23.242' N 126°29.548' E | plant sample, vegetation area 11 | | biomass determination |
| 164 | LD01-8155 | 11.08.01 | Samoylov 72°23.113' N 126°29.971' E | plant sample, vegetation area 12 | | biomass determination |
| 165 | LD01-8156 | 22.08.01 | Samoylov 72°22.532' N 126°30.253' E | plant sample, vegetation area 13, polygonborder | | biomass determination |
| 166 | LD01-8157 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | plant sample, vegetation area 14, polygonborder | | biomass determination |
| 167 | LD01-8158 | 23.08.01 | Samoylov 72°22.200' N 126°13.341' E | plant sample, vegetation area 14, polygoncentre | | biomass determination |
| 168 | LD01-8159 | 08.08.01 | Samoylov 72°20.217' N 126°29.515' E | plant sample, vegetation area 15 | | biomass determination |
| 169 | LD01-8160 | 14.08.01 | Samoylov 72°22.535' N 126°28.876' E | plant sample, vegetation area 21 | | biomass determination |
| 170 | LD01-8161 | 14.08.01 | Samoylov 72°22.537' N 126°29.021' E | plant sample, vegetation area 22 | | biomass determination |
| 171 | LD01-8162 | 14.08.01 | Samoylov 72°22.540' N 126°29.015' E | plant sample, vegetation area 23 | | biomass determination |
| 172 | LD01-8163 | 23.08.01 | Samoylov 72°23.100' N 126°28.935' E | plant sample, vegetation area 24 | | biomass determination |
| 173 | LD01-8164 | 22.09.01 | Samoylov 72°22.532' N 126°30.253' E | plant sample, vegetation area 13, polygoncentre | | biomass determination |
| 174 | LD01-8165 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | plant sample, vegetation area, K-02 | | biomass determination |
| 175 | LD01-8166 | 17.08.01 | Kurungnakh 72°21.216' N 126°13.333' E | plant sample, vegetation area, K-03 | | biomass determination |
| 176 | LD01-8167 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | plant sample, vegetation area, K-04 | | biomass determination |
| 177 | LD01-8168 | 20.08.01 | Kurungnakh 72°20.102' N 126°16.927' E | plant sample, vegetation area, K-05 | | biomass determination |
| 180 | LD01-8171 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | plant sample, vegetation area, S-01 | | biomass determination |
| 181 | LD01-8172 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | plant sample, vegetation area, S-02 | | biomass determination |
| 182 | LD01-8221 | 08.08.01 | Samoylov 72° 22.2' N 129° 28.5' E | plant sample, Carex concolor, air dried | | biomass determination |
| 183 | LD01-8222 | 08.08.01 | Samoylov 72° 22.2' N 129° 28.5' E | plant sample Carex concolor, 105°C dried | | biomass determination |
| 184 | LD01-8223 | 26.08.01 | Samoylov 72°22.535' N 126°28.679' E | soil sample, vegetation area 10, L-10 | +2-0 | soil physics, soil chemistry |
| 185 | LD01-8224 | 26.08.01 | Samoylov 72°22.535' N 126°28.679' E | soil sample, vegetation area 10, L-10 | 0-7 | soil physics, soil chemistry |
| 186 | LD01-8225 | 26.08.01 | Samoylov 72°22.535' N 126°28.679' E | soil sample, vegetation area 10, L-10 | 7-31 | soil physics, soil chemistry |
| 187 | LD01-8226 | 26.08.01 | Samoylov 72°22.535' N 126°28.679' E | soil sample, vegetation area 10, L-10 | 7-31 | soil physics, soil chemistry |
| 188 | LD01-8227 | 26.08.01 | Samoylov 72°22.535' N 126°28.679' E | soil sample, vegetation area 10, L-10 | 31-45 | soil physics, soil chemistry |
| 189 | LD01-8228 | 25.08.01 | Samoylov 72°22.532' N 126°30.253' E | moss, vegetation area 13 | | pollen |
| 190 | LD01-8229 | 26.08.01 | Samoylov 72°22.733' N 126°28.369' E | moss, vegetation area 9 | | pollen |

Table A3-5 (page 5): List of soil and plant samples (total amount = 196), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 191 | LD01-8230 | 26.08.01 | Samoylov 72°22.535' N 126°28.679' E | moss, vegetation area 10 | | pollen |
| 192 | LD01-8231 | 26.08.01 | Samoylov 72°22.535' N 126°28.876' E | moss, vegetation area 21 | | pollen |
| 193 | LD01-8232 | 26.08.01 | Samoylov 72°22.537' N 126°29.021' E | moss, vegetation area 22 | | pollen |
| 194 | LD01-8233 | 26.08.01 | Samoylov 72°22.540' N 126°29.015' E | moss, vegetation area 23 | | pollen |
| 195 | LD01-8239 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | Carex (Lake 1) | | biomass determination |
| 196 | LD01-8240 | 14.08.01 | Sardakh 72°33.459' N 127°10.016' E | Carex (Lake 2) | | biomass determination |

grain size analysis
/nitrogen ratio, cations, pH, $C_{org}$
ity, enrichment and charcterization of microbes
luorescence in situ hybridization
$C_{org}$, carbon/nitrogen ratio

**Table A3-6: List of sediment and water samples (total amount = 31), collected at Samoylov during the expedition Lena Delta 2001.**

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 1 | LD01-8174 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 0-2 | geochemical |
| 2 | LD01-8175 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 2-4 | geochemical |
| 3 | LD01-8176 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 4-6 | geochemical |
| 4 | LD01-8177 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 6-8 | geochemical |
| 5 | LD01-8178 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 8-10 | geochemical |
| 6 | LD01-8179 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 10-12 | geochemical |
| 7 | LD01-8180 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 12-14 | geochemical |
| 8 | LD01-8181 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 14-16 | geochemical |
| 9 | LD01-8182 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 16-18 | geochemical |
| 10 | LD01-8183 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 3 | 18-20 | geochemical |
| 11 | LD01-8184 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 1 | 0-2 | microbiological, molecularbiological |
| 12 | LD01-8185 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 1 | 2-4 | microbiological, molecularbiological |
| 13 | LD01-8186 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 1 | 4-8 | microbiological, molecularbiological |
| 14 | LD01-8187 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 1 | 8-12 | microbiological, molecularbiological |
| 15 | LD01-8188 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 1 | 12-16 | microbiological, molecularbiological |
| 16 | LD01-8189 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 1 | 16-18 | microbiological, molecularbiological |
| 17 | LD01-8190 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 0-2 | microbiological |
| 18 | LD01-8191 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 2-4 | microbiological |
| 19 | LD01-8192 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 4-8 | microbiological |
| 20 | LD01-8193 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 8-12 | microbiological |
| 21 | LD01-8194 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 12-16 | microbiological |
| 22 | LD01-8195 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 16-20 | microbiological |
| 23 | LD01-8196 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample, core 2 | 20-23 | microbiological |
| 24 | LD01-8197 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | water sample | water surface | gas |
| 25 | LD01-8198 | 23.08.02 | Samoylov 72° 22 066' N 126° 29 209' E | water sample | water surface | gas |
| 26 | LD01-8199 | 23.08.03 | Samoylov 72° 22 066' N 126° 29 209' E | water sample | water surface | gas |
| 27 | LD01-8200 | 23.08.04 | Samoylov 72° 22 066' N 126° 29 209' E | water sample | water surface | hydrochemical |
| 28 | LD01-8203 | 23.08.06 | Samoylov 72° 22 066' N 126° 29 209' E | water sample | 80 | ostracodes |
| 29 | LD01-8204 | 23.08.07 | Samoylov, lake close to the sauna | water sample | 80 | ostracodes |
| 30 | LD01-8202 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample | 0-3 | ostracodes |
| 31 | LD01-8207 | 24.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | sediment sample | 0-25 | micromorphological |

**Table A3-7 (page 1): List of ice wedge samples (total amount = 64), collected in central Lena Delta during the expedition Lena Delta 2001.**

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 1 | LD01-6693 | 27.07.02 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 20 cm distance from right end of ice wedge 1 | 350 | gas[1], hydro chemical[2], microbiological[3], molecularbiological[4], Isotope[5] |
| 2 | LD01-6694 | 27.07.02 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 40 cm distance from right end of ice wedge 1 | 350 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 3 | LD01-6695 | 27.07.02 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 60 cm distance from right end of ice wedge 1 | 350 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 4 | LD01-6696 | 27.07.02 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 80 cm distance from right end of ice wedge 1 | 350 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 5 | LD01-6697 | 27.07.02 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 140 cm distance from right end of ice wedge 1 | 350 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 6 | LD01-6698 | 28.07.02 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 30 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 7 | LD01-6699 | 28.07.01 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 60 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 8 | LD01-6700 | 28.07.00 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 90 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 9 | LD01-6701 | 28.07.99 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 120 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 10 | LD01-6702 | 28.07.98 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 150 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 11 | LD01-6703 | 28.07.97 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 180 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 12 | LD01-6704 | 28.07.96 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 210 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 13 | LD01-6705 | 28.07.95 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 240 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 14 | LD01-6706 | 28.07.94 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 270 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 15 | LD01-6707 | 28.07.93 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 300 cm distance from right end of ice wedge 2 | 300 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 16 | LD01-6708 | 28.07.92 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 270 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 17 | LD01-6709 | 28.07.91 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 240 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 18 | LD01-6710 | 28.07.90 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 210 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 19 | LD01-6711 | 28.07.89 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 180 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 20 | LD01-6712 | 28.07.88 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 150 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 21 | LD01-6713 | 28.07.87 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 22 | LD01-6714 | 28.07.86 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 20 cm right from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 23 | LD01-6715 | 28.07.85 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 40 cm right from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 24 | LD01-6716 | 28.07.84 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 60 cm right from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 25 | LD01-6717 | 28.07.83 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 80 cm right from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 26 | LD01-6718 | 28.07.82 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 20 cm left from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 27 | LD01-6719 | 28.07.81 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 40 cm left from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 28 | LD01-6720 | 28.07.80 | Samoylov 72°21.995' N 126°29.333' E | ice sample, 60 cm left from middle of ice wedge 2 | 120 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 29 | LD01-6721 | 28.07.79 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 90 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 30 | LD01-6722 | 28.07.78 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 60 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 31 | LD01-6723 | 28.07.77 | Samoylov 72°21.995' N 126°29.333' E | ice sample, middle of ice wedge 2 | 30 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 32 | LD01-6724 | 22.07.76 | Samoylov 72°22.2' N 129° 28.5' E | ice sample, ice wedge at P-01, centre of the crack | 0-5 | gas |
| 33 | LD01-6725 | 22.07.75 | Samoylov 72°22.2' N 129° 28.5' E | ice sample, ice wedge at P-01, centre of the crack | 5-10 | gas |
| 34 | LD01-6726 | 22.07.74 | Samoylov 72°22.2' N 129° 28.5' E | ice sample, ice wedge at P-01, centre of the crack | 10-15 | gas |
| 35 | LD01-6727 | 22.07.73 | Samoylov 72°22.2' N 129° 28.5' E | ice sample, ice wedge at P-01, centre of the crack | 15-20 | gas |
| 36 | LD01-6728 | 22.07.72 | Samoylov 72°22.2' N 129° 28.5' E | ice sample, ice wedge at P-01, centre of the crack | 20-25 | gas |
| 37 | LD01-6729 | 22.07.71 | Samoylov 72°22.2' N 129° 28.5' E | ice sample, ice wedge at P-01, border of the ice wedge | 0-20 | gas |
| 38 | LD01-6879 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 0-20 | hydro chemical, Isotope, sediment quantity[6] |
| 39 | LD01-6880 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 20-37 | hydro chemical, Isotope, sediment quantity |
| 40 | LD01-6881 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 37-52 | hydro chemical, Isotope, sediment quantity |
| 41 | LD01-6882 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 52-66 | hydro chemical, Isotope, sediment quantity |
| 42 | LD01-6883 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 66-76 | hydro chemical, Isotope, sediment quantity |
| 43 | LD01-6884 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 78-94 | hydro chemical, Isotope, sediment quantity |
| 44 | LD01-6885 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 95-121 | hydro chemical, Isotope, sediment quantity |
| 45 | LD01-6886 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 122-137 | hydro chemical, Isotope, sediment quantity |

Table A3-7 (page 2): List of ice wedge samples (total amount = 64), collected in central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 46 | LD01-6887 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 137-152 | hydro chemical, Isotope, sediment quantity |
| 47 | LD01-6888 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 152-168 | hydro chemical, Isotope, sediment quantity |
| 48 | LD01-6889 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 168-190 | hydro chemical, Isotope, sediment quantity |
| 49 | LD01-6890 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 20-100 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 50 | LD01-6891 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 100-190 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 51 | LD01-6892 | 13.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | ice sample | 0-20 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 52 | LD01-6928 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-01 | 28-38 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 53 | LD01-6929 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-02/1 | 38-141 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 54 | LD01-6930 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-02/2 | 141-231 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 55 | LD01-6931 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/1.1 | 800 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 56 | LD01-6932 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/1.2 | 800 | sediment quantity |
| 57 | LD01-6933 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/2.1 | 800 | sediment quantity |
| 58 | LD01-6934 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/2.2 | 800 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 59 | LD01-6935 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/3.1 | 800 | sediment quantity |
| 60 | LD01-6936 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/3.2 | 800 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 61 | LD01-6937 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/4.1 | 800 | sediment quantity |
| 62 | LD01-6938 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/4.2 | 800 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 63 | LD01-6939 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/5.1 | 800 | gas, hydro chemical, microbiological, molecularbiological, Isotope |
| 64 | LD01-6940 | 20.08.01 | Kurungnakh 72° 20.314' E 126° 17.079' | ice sample, core S-03/5.2 | 800 | sediment quantity |

rbon dioxide content analysis
ations, anions, conductivity, pH
ent and characterization of microbes
orescence in situ hybridization
O Isotope analysis
ity: amount of sediment

Table A3-8 (page 1): List of permafrost sediment samples (total amount = 182), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 1 | LD01-6730 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 35-46 | geochemical, microbiological, molecularbiological |
| 2 | LD01-6731 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 46-61 | geochemical, microbiological, molecularbiological |
| 3 | LD01-6732 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 61-78 | geochemical, microbiological, molecularbiological |
| 4 | LD01-6733 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 78-102 | geochemical, microbiological, molecularbiological |
| 5 | LD01-6734 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 102-114 | geochemical, microbiological, molecularbiological |
| 6 | LD01-6735 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 114-122 | geochemical, microbiological, molecularbiological |
| 7 | LD01-6736 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 122-141 | geochemical, microbiological, molecularbiological |
| 8 | LD01-6737 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 141-156 | geochemical, microbiological, molecularbiological |
| 9 | LD01-6738 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 156-164 | geochemical, microbiological, molecularbiological |
| 10 | LD01-6739 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 164-175 | geochemical, microbiological, molecularbiological |
| 11 | LD01-6740 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 175-183 | geochemical, microbiological, molecularbiological |
| 12 | LD01-6741 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 183-191 | geochemical, microbiological, molecularbiological |
| 13 | LD01-6742 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 191-198 | geochemical, microbiological, molecularbiological |
| 14 | LD01-6743 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 198-218 | geochemical, microbiological, molecularbiological |
| 15 | LD01-6744 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 218-233 | geochemical, microbiological, molecularbiological |
| 16 | LD01-6745 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 233-249 | geochemical, microbiological, molecularbiological |
| 17 | LD01-6746 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 249-255 | geochemical, microbiological, molecularbiological |
| 18 | LD01-6747 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 255-263 | geochemical, microbiological, molecularbiological |
| 19 | LD01-6748 | 31.07.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 1 | 263-269 | geochemical, microbiological, molecularbiological |
| 20 | LD01-6749 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 32-55 | geochemical, microbiological, molecularbiological |
| 21 | LD01-6750 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 55-65 | geochemical, microbiological, molecularbiological |
| 22 | LD01-6751 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 65-82 | geochemical, microbiological, molecularbiological |
| 23 | LD01-6752 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 82-94 | geochemical, microbiological, molecularbiological |
| 24 | LD01-6753 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 94-111 | geochemical, microbiological, molecularbiological |
| 25 | LD01-6754 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 111-138 | geochemical, microbiological, molecularbiological |
| 26 | LD01-6755 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 138-150 | geochemical, microbiological, molecularbiological |
| 27 | LD01-6756 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 150-164 | geochemical, microbiological, molecularbiological |
| 28 | LD01-6757 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 164-184 | geochemical, microbiological, molecularbiological |
| 29 | LD01-6758 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 184-195 | geochemical, microbiological, molecularbiological |
| 30 | LD01-6759 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 195-216 | geochemical, microbiological, molecularbiological |
| 31 | LD01-6760 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 216-232 | geochemical, microbiological, molecularbiological |
| 32 | LD01-6761 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 232-247 | geochemical, microbiological, molecularbiological |
| 33 | LD01-6762 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 247-262 | geochemical, microbiological, molecularbiological |
| 34 | LD01-6763 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 262-265 | geochemical, microbiological, molecularbiological |
| 35 | LD01-6764 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 265-274 | geochemical, microbiological, molecularbiological |
| 36 | LD01-6765 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 274-292 | geochemical, microbiological, molecularbiological |
| 37 | LD01-6766 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 292-304 | geochemical, microbiological, molecularbiological |
| 38 | LD01-6767 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 304-310 | geochemical, microbiological, molecularbiological |
| 39 | LD01-6768 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 310-327 | geochemical, microbiological, molecularbiological |
| 40 | LD01-6769 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 327-331 | geochemical, microbiological, molecularbiological |
| 41 | LD01-6770 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 331-336 | geochemical, microbiological, molecularbiological |

Table A3-8 (page 2): List of permafrost sediment samples (total amount = 182), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 42 | LD01-6771 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 336-346 | geochemical, microbiological, molecularbiological |
| 43 | LD01-6772 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 346-364 | geochemical, microbiological, molecularbiological |
| 44 | LD01-6773 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 364-376 | geochemical, microbiological, molecularbiological |
| 45 | LD01-6774 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 376-393 | geochemical, microbiological, molecularbiological |
| 46 | LD01-6775 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 393-396 | geochemical, microbiological, molecularbiological |
| 47 | LD01-6776 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 396-416 | geochemical, microbiological, molecularbiological |
| 48 | LD01-6777 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 416-428 | geochemical, microbiological, molecularbiological |
| 49 | LD01-6778 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 428-441 | geochemical, microbiological, molecularbiological |
| 50 | LD01-6779 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 441-446 | geochemical, microbiological, molecularbiological |
| 51 | LD01-6780 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 446-456 | geochemical, microbiological, molecularbiological |
| 52 | LD01-6781 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 456-466 | geochemical, microbiological, molecularbiological |
| 53 | LD01-6782 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 466-483 | geochemical, microbiological, molecularbiological |
| 54 | LD01-6783 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 483-495 | geochemical, microbiological, molecularbiological |
| 55 | LD01-6784 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 495-502 | geochemical, microbiological, molecularbiological |
| 56 | LD01-6785 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 502-519 | geochemical, microbiological, molecularbiological |
| 57 | LD01-6786 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 519-532 | geochemical, microbiological, molecularbiological |
| 58 | LD01-6787 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 532-549 | geochemical, microbiological, molecularbiological |
| 59 | LD01-6788 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 549-565 | geochemical, microbiological, molecularbiological |
| 60 | LD01-6789 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 565-575 | geochemical, microbiological, molecularbiological |
| 61 | LD01-6790 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 575-592 | geochemical, microbiological, molecularbiological |
| 62 | LD01-6791 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 592-605 | geochemical, microbiological, molecularbiological |
| 63 | LD01-6792 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 605-622 | geochemical, microbiological, molecularbiological |
| 64 | LD01-6793 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 622-631 | geochemical, microbiological, molecularbiological |
| 65 | LD01-6794 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 631-645 | geochemical, microbiological, molecularbiological |
| 66 | LD01-6795 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 645-662 | geochemical, microbiological, molecularbiological |
| 67 | LD01-6796 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 662-676 | geochemical, microbiological, molecularbiological |
| 68 | LD01-6797 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 676-695 | geochemical, microbiological, molecularbiological |
| 69 | LD01-6798 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 695-710 | geochemical, microbiological, molecularbiological |
| 70 | LD01-6799 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 710-728 | geochemical, microbiological, molecularbiological |
| 71 | LD01-6800 | 02.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 728-743 | geochemical, microbiological, molecularbiological |
| 72 | LD01-6801 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 743-758 | geochemical, microbiological, molecularbiological |
| 73 | LD01-6802 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 758-776 | geochemical, microbiological, molecularbiological |
| 74 | LD01-6803 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 776-790 | geochemical, microbiological, molecularbiological |
| 75 | LD01-6804 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 790-806 | geochemical, microbiological, molecularbiological |
| 76 | LD01-6805 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 806-821 | geochemical, microbiological, molecularbiological |
| 77 | LD01-6806 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 821-838 | geochemical, microbiological, molecularbiological |
| 78 | LD01-6807 | 03.08.01 | Samoylov 72°22.184' N 126° 28.833' E | permafrost sample, core 2 | 838-854 | geochemical, microbiological, molecularbiological |
| 79 | LD01-6808 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 25-51 | geochemical, microbiological, molecularbiological |
| 80 | LD01-6809 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 51-67 | geochemical, microbiological, molecularbiological |
| 81 | LD01-6810 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 67-83 | geochemical, microbiological, molecularbiological |
| 82 | LD01-6811 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 83-102 | geochemical, microbiological, molecularbiological |

Table A3-8 (page 3): List of permafrost sediment samples (total amount = 182), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 83 | LD01-6812 a | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 102-120 | geochemical, microbiological, molecularbiological |
| 84 | LD01-6812 b | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 120-137 | geochemical, microbiological, molecularbiological |
| 85 | LD01-6813 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 137-150 | geochemical, microbiological, molecularbiological |
| 86 | LD01-6814 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 159-166 | geochemical, microbiological, molecularbiological |
| 87 | LD01-6815 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 166-189 | geochemical, microbiological, molecularbiological |
| 88 | LD01-6816 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 189-205 | geochemical, microbiological, molecularbiological |
| 89 | LD01-6817 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 205-215 | geochemical, microbiological, molecularbiological |
| 90 | LD01-6818 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 215-234 | geochemical, microbiological, molecularbiological |
| 91 | LD01-6819 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 234-247 | geochemical, microbiological, molecularbiological |
| 92 | LD01-6820 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 247-263 | geochemical, microbiological, molecularbiological |
| 93 | LD01-6821 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 263-276 | geochemical, microbiological, molecularbiological |
| 94 | LD01-6822 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 276-291 | geochemical, microbiological, molecularbiological |
| 95 | LD01-6823 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 291-302 | geochemical, microbiological, molecularbiological |
| 96 | LD01-6824 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 302-320 | geochemical, microbiological, molecularbiological |
| 97 | LD01-6825 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 320-336 | geochemical, microbiological, molecularbiological |
| 98 | LD01-6826 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 336-351 | geochemical, microbiological, molecularbiological |
| 99 | LD01-6827 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 351-366 | geochemical, microbiological, molecularbiological |
| 100 | LD01-6828 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 366-382 | geochemical, microbiological, molecularbiological |
| 101 | LD01-6829 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 382-394 | geochemical, microbiological, molecularbiological |
| 102 | LD01-6830 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 394-413 | geochemical, microbiological, molecularbiological |
| 103 | LD01-6831 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 413-427 | geochemical, microbiological, molecularbiological |
| 104 | LD01-6832 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 427-442 | geochemical, microbiological, molecularbiological |
| 105 | LD01-6833 | 04.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 442-457 | geochemical, microbiological, molecularbiological |
| 106 | LD01-6834 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 457-475 | geochemical, microbiological, molecularbiological |
| 107 | LD01-6835 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 475-491 | geochemical, microbiological, molecularbiological |
| 108 | LD01-6836 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 491-501 | geochemical, microbiological, molecularbiological |
| 109 | LD01-6837 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 501-517 | geochemical, microbiological, molecularbiological |
| 110 | LD01-6838 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 517-534 | geochemical, microbiological, molecularbiological |
| 111 | LD01-6839 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 534-546 | geochemical, microbiological, molecularbiological |
| 112 | LD01-6840 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 546-562 | geochemical, microbiological, molecularbiological |
| 113 | LD01-6841 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 562-576 | geochemical, microbiological, molecularbiological |
| 114 | LD01-6842 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 576-590 | geochemical, microbiological, molecularbiological |
| 115 | LD01-6843 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 590-605 | geochemical, microbiological, molecularbiological |
| 116 | LD01-6844 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 605-617 | geochemical, microbiological, molecularbiological |
| 117 | LD01-6845 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 617-630 | geochemical, microbiological, molecularbiological |
| 118 | LD01-6846 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 630-642 | geochemical, microbiological, molecularbiological |
| 119 | LD01-6847 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 642-654 | geochemical, microbiological, molecularbiological |
| 120 | LD01-6848 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 654-666 | geochemical, microbiological, molecularbiological |
| 121 | LD01-6849 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 666-680 | geochemical, microbiological, molecularbiological |
| 122 | LD01-6850 | 05.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 680-694 | geochemical, microbiological, molecularbiological |
| 123 | LD01-6851 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 694-703 | geochemical, microbiological, molecularbiological |

Table A3-8 (page 4): List of permafrost sediment samples (total amount = 182), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 124 | LD01-6852 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 703-714 | geochemical, microbiological, molecularbiological |
| 125 | LD01-6853 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 714-725 | geochemical, microbiological, molecularbiological |
| 126 | LD01-6854 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 725-741 | geochemical, microbiological, molecularbiological |
| 127 | LD01-6855 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 741-759 | geochemical, microbiological, molecularbiological |
| 128 | LD01-6856 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 759-773 | geochemical, microbiological, molecularbiological |
| 129 | LD01-6857 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 773-790 | geochemical, microbiological, molecularbiological |
| 130 | LD01-6858 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 790-803 | geochemical, microbiological, molecularbiological |
| 131 | LD01-6859 | 07.08.02 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 803-816 | geochemical, microbiological, molecularbiological |
| 132 | LD01-6860 | 07.08.01 | Samoylov 72°22 002' N 126° 29 338' E | permafrost sample, core 3 | 816-826 | geochemical, microbiological, molecularbiological |
| 133 | LD01-6861 | 13.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 0-27 | geochemical, microbiological, molecularbiological |
| 134 | LD01-6862 | 13.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 27-76 | geochemical, microbiological, molecularbiological |
| 135 | LD01-6863 | 13.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 76-104 | geochemical, microbiological, molecularbiological |
| 136 | LD01-6864 | 13.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 104-143 | geochemical, microbiological, molecularbiological |
| 137 | LD01-6865 | 13.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 143-169 | geochemical, microbiological, molecularbiological |
| 138 | LD01-6866 | 13.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 169-192 | geochemical, microbiological, molecularbiological |
| 139 | LD01-6867 | 14.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 192-224 | geochemical, microbiological, molecularbiological |
| 140 | LD01-6868 | 14.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 224-276 | geochemical, microbiological, molecularbiological |
| 141 | LD01-6869 | 14.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 276-317 | geochemical, microbiological, molecularbiological |
| 142 | LD01-6870 | 14.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 317-353 | geochemical, microbiological, molecularbiological |
| 143 | LD01-6871 | 14.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 353-381 | geochemical, microbiological, molecularbiological |
| 144 | LD01-6872 | 15.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 381-387 | geochemical, microbiological, molecularbiological |
| 145 | LD01-6873 | 15.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 387-422 | geochemical, microbiological, molecularbiological |
| 146 | LD01-6874 | 15.08.01 | Sardakh 72°33 465' N 127° 10 007' E | permafrost sample, core 4 | 422-457 | geochemical, microbiological, molecularbiological |
| 147 | LD01-6875 | 17.08.01 | Kurungnakh 72° 20 392' N 126° 17 711' E | permafrost sample, core 5 | 41-67 | molecularbiological |
| 148 | LD01-6876 | 17.08.01 | Kurungnakh 72° 20 392' N 126° 17 711' E | permafrost sample, core 5 | 78-94 | molecularbiological |
| 149 | LD01-6877 | 17.08.01 | Kurungnakh 72° 20 392' N 126° 17 711' E | permafrost sample, core 5 | 187-194 | molecularbiological |
| 150 | LD01-6878 | 17.08.01 | Kurungnakh 72° 20 392' N 126° 17 711' E | permafrost sample, core 5 | 254-269 | molecularbiological |
| 151 | LD01-6896 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 0-40 | geochemical, microbiological, molecularbiological |
| 152 | LD01-6897 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 40-41 | geochemical, microbiological, molecularbiological |
| 153 | LD01-6898 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 51-76 | geochemical, microbiological, molecularbiological |
| 154 | LD01-6899 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 76-94 | geochemical, microbiological, molecularbiological |
| 155 | LD01-6900 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 94-112 | geochemical, microbiological, molecularbiological |
| 156 | LD01-6901 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 112-129 | geochemical, microbiological, molecularbiological |
| 157 | LD01-6902 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 129-153 | geochemical, microbiological, molecularbiological |
| 158 | LD01-6903 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 153-172 | geochemical, microbiological, molecularbiological |
| 159 | LD01-6904 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 172-185 | geochemical, microbiological, molecularbiological |
| 160 | LD01-6905 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 185-200 | geochemical, microbiological, molecularbiological |
| 161 | LD01-6906 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 200-213 | geochemical, microbiological, molecularbiological |
| 162 | LD01-6907 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 213-224 | geochemical, microbiological, molecularbiological |
| 163 | LD01-6908 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 224-230 | geochemical, microbiological, molecularbiological |
| 164 | LD01-6909 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 230-242 | geochemical, microbiological, molecularbiological |

Table A3-8 (page 5): List of permafrost sediment samples (total amount = 182), collected at central Lena Delta during the expedition Lena Delta 2001.

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 165 | LD01-6910 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 242-258 | geochemical, microbiological, molecularbiological |
| 166 | LD01-6911 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 258-273 | geochemical, microbiological, molecularbiological |
| 167 | LD01-6912 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 273-289 | geochemical, microbiological, molecularbiological |
| 168 | LD01-6913 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 289-303 | geochemical, microbiological, molecularbiological |
| 169 | LD01-6914 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 303-313 | geochemical, microbiological, molecularbiological |
| 170 | LD01-6915 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 313-327 | geochemical, microbiological, molecularbiological |
| 171 | LD01-6916 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 327-341 | geochemical, microbiological, molecularbiological |
| 172 | LD01-6917 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 341-355 | geochemical, microbiological, molecularbiological |
| 173 | LD01-6918 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 355-370 | geochemical, microbiological, molecularbiological |
| 174 | LD01-6919 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 370-374 | geochemical, microbiological, molecularbiological |
| 175 | LD01-6920 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 374-401 | geochemical, microbiological, molecularbiological |
| 176 | LD01-6921 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 401-418 | geochemical, microbiological, molecularbiological |
| 177 | LD01-6922 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 418-434 | geochemical, microbiological, molecularbiological |
| 178 | LD01-6923 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 434-448 | geochemical, microbiological, molecularbiological |
| 179 | LD01-6924 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 448-468 | geochemical, microbiological, molecularbiological |
| 180 | LD01-6925 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 468-483 | geochemical, microbiological, molecularbiological |
| 181 | LD01-6926 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 483-503 | geochemical, microbiological, molecularbiological |
| 182 | LD01-6927 | 18.08.01 | Kurungnakh 72° 20 314' N 126° 17 079' E | permafrost sample, core 6 | 503-520 | geochemical, microbiological, molecularbiological |

**Table A3-9: List of gas samples (total amount = 18), collected at central Lena Delta during the expedition Lena Delta 2001.**

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 1 | LD01-6685 | 26.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | gas sample, polygoncentre | surface of the ice wedge | methane content, Isotopes |
| 2 | LD01-6686 | 26.07.01 | Samoylov 72° 22.2' N 129° 28.5' E | gas sample, polygoncentre | surface of the ice wedge | methane content, Isotopes |
| 3 | LD01-8201 | 23.08.01 | Samoylov 72° 22 066' N 126° 29 209' E | gas sample, polygonlake | bottom of the lake | methane content, Isotopes |
| 4 | LD01-8216 | 15.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | gas sample, polygonlake | bottom of the lake | methane content, Isotopes |
| 5 | LD01-8217 | 15.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | gas sample, polygonlake | bottom of the lake | methane content, Isotopes |
| 6 | LD01-8218 | 15.08.01 | Sardakh 72° 33.465' N 127° 10.007' E | gas sample, polygonlake | bottom of the lake | methane content, Isotopes |
| 7 | LD01-8219 | 20.08.01 | Kurungnakh | gas sample | bottom of the lake | methane content, Isotopes |
| 8 | LD01-8220 | 21.08.01 | Kurungnakh | gas sample | bottom of the lake | methane content, Isotopes |
| 9 | LD01-8368 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 10 | LD01-8369 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 11 | LD01-8370 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 12 | LD01-8371 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 13 | LD01-8372 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 14 | LD01-8373 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 15 | LD01-8374 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 16 | LD01-8375 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 17 | LD01-8376 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |
| 18 | LD01-8377 | 22.07.01 | Samoylov | gas sample | surface | Isotopes |

**Table A 4-1: List of birds and their status in the study area.**

| No. | Species | Status | Proportion in bird population, % | Density, Ind/km$^2$ |
|---|---|---|---|---|
| 1 | Gavia stelleri | B | 1.90 | 0.54 |
| 2 | Gavia arctica | B | 1.71 | 0.23 |
| 3 | Clangula hyemalis | + | 2.48 | 2.03 |
| 4 | Somateria spectabilis | B | 5.90 | 1.72 |
| 5 | Polysticta stelleri | + | 0.19 | - |
| 6 | Lagopus mutus | B | 5.90 | - |
| 7 | Pluvialis squatarola | B | 4.00 | 1.92 |
| 8 | Charadrius hiaticula | B? | 3.24 | - |
| 9 | Arenaria interpres | B? | 0.76 | - |
| 10 | Phalaropus fulicarius | ? | 0.38 | - |
| 11 | Phylomachus pugnax | ? | 0.95 | - |
| 12 | Calidris minuta | B | 28.95 | - |
| 13 | Calidris ferruginea | ? | 0.76 | 2.5 |
| 14 | Calidris alpina | ? | 2.10 | 3.75 |
| 15 | Calidris alba | F | 5.33 | - |
| 16 | Stercorarius parasiticus | + | 0.57 | - |
| 17 | Larus argentatus | B | 18.29 | - |
| 18 | Larus hyperboreus | B | 2.48 | 0.33 |
| 19 | Xema sabini | B | 6.48 | 1.92 |
| 20 | Sterna paradisaea | B | 2.67 | - |
| 21 | Calcarius lapponicus | B | 0.95 | 1.0 |
| 22 | Plectrophenax nivalis | B | 0.19 | - |

B – breeding; B? – probably breeding; + - over summering;

? – status unknown; F - flying species.

**Table A 4-2:List of trapped lemmings**

| No. | Species | Weight (g) | Sex | Age/reproductive state |
|---|---|---|---|---|
| 1 | Dicrostonyx torquatus | 94 | female | Adult, pregnant, 3 fetuses |
| 2 | Lemmus sibiricus | 66 | male | Adult, testis 16x11 |
| 3 | -"- | 62,5 | male | Adult, 14x10 |
| 4 | -"- | 54 | male | Adult, 13x10 |
| 5 | -"- | 36 | female | Subadult, 3 fetuses |
| 6 | -"- | 32 | male | Subadult, testis 7x6 |
| 7 | -"- | 55,5 | male | Adult, testis 15x12 |
| 8 | -"- | 32 | female | Subadult, farrow |

**Table A7-1:** Water temperature vertical profiles in the Sanga-Dzhie and Sanga-Lake lagoons, Oleneksky Bay, July 26-28, 2001.

| Depth, m | Station Sanga-Dzhie Lagoon (°C) | Station Sanga-Lake Lagoon (°C) | |
|---|---|---|---|
| | | by mercury thermometer | by thermal cable with temperature sensors |
| 0 | 14,9 | 15,0 | 14,90 |
| 1 | 14,7 | 14,9 | |
| 2 | 14,3 | 13,7 | |
| 3 | 13,4 | 6,7 | |
| 4 | 3,5 | 2,2 | 2,55 |
| 5 | 1,4 | -1,2 | |
| 6 | 0,3 | -1,4 | |
| 7 | -0,7 | -1,8 | -2,20 |
| 8 | -1,2 | -2,2 | -2,42 |
| 9 | -0,5 | -2,4 | -2,38 |
| 10 | -1,0 | 3,0 | |
| 11 | -0,9 | | |
| 12 | -0,8 | | |
| 13 | -0,9 | | |
| 14 | -0,9 | | |
| 15 | -1,0 | | |
| 16 | -1,0 | | |
| 17 | -1,0 | | |
| 18 | -1,0 | | |
| 19 | -1,0 | | |
| 20 | -1,0 | | |

**Table A7-2:** Active layer depths in the Arga region. Sangha-Dzhie / Babaryna-Belkee, 30.07.2001.

| Relief | Soil surface | Active layer, •m |
|---|---|---|
| | *Babaruna-Bel'kee* | |
| beach | sand | 79 |
| dunes | sand | 95 |
| cliff | peat | 54 |
| drained lake depression | peaty silty-sandy deposits | 76 |
| drained lake depression | peaty silty-sandy deposits | 74 |
| slope of depression | Sand with peat layers | 68 |
| cut dunes | sand | 73 |
| low ground between cut dunes | Turfy sand | 57 |
| low ground between dead dunes | turf | 43 |
| | *Sanga-Dzhie* | |
| watershed | wet centre polygon | 35 |
| sand ridge | sparse lichen-moss cover | 70 |
| deflation depression | sand | 75 |
| lake cliff | sand | 120 |
| lake depression slope | turfy sand | 80 |
| watershed | herb tundra | centre – 35; crack – 55: border - 60 |
| shallows water layer – 0,2-0,15 cm | sand | 95 |

**Table A7-3:** Investigation sites in the Arga region. Sanga-Dzhie/Babaryna-Belkee.

| Site Code | Description | Geographic Coordinates | Investigations in the field | Sample Type (Codes) | Planned Analyses |
|---|---|---|---|---|---|
| SDS1 | summit of a rise | 73° 31,735' N, 123° 25,606 E | | | |
| a | moist tundra | | $CH_4$ emission; characterisation and sampling of soil | air-dried soil; cooled moist soil (LD01 8035-8039) | soil chemistry, particle size distribution, soil microbiology |
| b | wet, swampy tundra | | $CH_4$ emission | | |
| c | thermokarst mire (ø 15 m), vegetated part | | $CH_4$ emission | | |
| d | thermokarst mire (ø 15 m), unvegetated | | $CH_4$ emission | | |
| SDS2 | slope shoulder of a rise, dry tundra | 73° 31,766' N, 123° 25,309' E | $CH_4$ emission; characterisation and sampling of one soil profile | air-dried soil; cooled moist soil (LD01 8029-8034) | soil chemistry, particle size distribution, soil microbiology |
| SDS3 | slope, deflation section, intense Fe-translocation | 73° 32,151' N, 123° 29,023' E | characterisation and sampling of one soil profile | air-dried soil (LD01 8040-8046) | soil chemistry, particle size distribution |
| SDS4 | Coastal cliff, Babaryna Tumsa Cape | 73° 34,512' N, 123° 21,815' E | sampling of soil and permafrost sediments | air-dried sediments; cooled moist sediments (LD01 8047-8053) | soil chemistry, particle size distribution, soil microbiology, pollen analysis, radio-carbon dating |
| ONL1 | Ochchugun-Nerpalakh Lake, vegetated, shallow rim of large thermo-karst lake | 73° 31,903' N, 123° 27,277' E | $CH_4$ emission | | |
| ONL2 | Ochchugun-Nerpalakh Lake, deep centre of large thermo-karst lake | 73° 31,637' N, 123° 28,271' E | $CH_4$ emission; sampling of lake sediments and water column | cooled sediment cores (LD01 8207-8209); cooled water samples (LD01 8248-8351) | Sediment geo-chemistry and microbiology; chemistry and $CH_4$ content of water |
| UL | Ugly Laguna | 73° 32,288' N, 123° 26,076' E | sampling of sediments and water column | Cooled sediment cores (LD01 8211-8213); cooled water samples (LD01 8287-8320; HH01 N1-N11) | Sediment geo-chemistry and microbiology; chemistry and $CH_4$ content of water |

Table A7-4 (page 1): List of samples (total amount = 257), collected in the region Sanga-Dzhie / Babaryna-Belkee during the expedition Lena Delta 2001 (team 2).

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 1 | LD01-8029 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | soil sample, A-01, dry tundra (site SDS2) | 0-7 | soil physics, soil chemistry, microbiological, molecularbiological |
| 2 | LD01-8030 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | soil sample, A-01, dry tundra (site SDS2) | 7-21 | soil physics, soil chemistry, microbiological, molecularbiological |
| 3 | LD01-8031 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | soil sample, A-01, dry tundra (site SDS2) | 21-29 | soil physics, soil chemistry, microbiological, molecularbiological |
| 4 | LD01-8032 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | soil sample, A-01, dry tundra (site SDS2) | 29-47 | soil physics, soil chemistry, microbiological, molecularbiological |
| 5 | LD01-8033 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | soil sample, A-01, dry tundra (site SDS2) | 47-70 | soil physics, soil chemistry, microbiological, molecularbiological |
| 6 | LD01-8034 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | soil sample, A-01, dry tundra (site SDS2) | 47-70 | soil physics, soil chemistry, microbiological, molecularbiological |
| 7 | LD01-8035 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, A-02, moist tundra (site SDS1a) | 0-5 | soil physics, soil chemistry, microbiological, molecularbiological |
| 8 | LD01-8036 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, A-02, moist tundra (site SDS1a) | 5-13 | soil physics, soil chemistry, microbiological, molecularbiological |
| 9 | LD01-8037 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, A-02, moist tundra (site SDS1a) | 13-20 | soil physics, soil chemistry, microbiological, molecularbiological |
| 10 | LD01-8038 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, A-02, moist tundra (site SDS1a) | 20-35 | soil physics, soil chemistry, microbiological, molecularbiological |
| 11 | LD01-8039 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, A-02, moist tundra (site SDS1a) | 20-35 | soil physics, soil chemistry, microbiological, molecularbiological |
| 12 | LD01-8040 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | 0-10 | soil physics, soil chemistry |
| 13 | LD01-8041 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | 10-33 | soil physics, soil chemistry |
| 14 | LD01-8042 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | 33-37 | soil physics, soil chemistry |
| 15 | LD01-8043 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | 37-46 | soil physics, soil chemistry |
| 16 | LD01-8044 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | 46-76 | soil physics, soil chemistry |
| 17 | LD01-8045 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | 76-120 | soil physics, soil chemistry |
| 18 | LD01-8046 | 01.08.01 | Arga 73° 32,151' N 123° 29,023' E | soil sample, A-03, dry tundra, deflation cliff, pseudomorphosis (site SDS3) | (FeO layer) | soil physics, soil chemistry |
| 19 | LD01-8047 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 0-30 | soil physics, soil chemistry, microbiological, molecularbiological |
| 20 | LD01-8048 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 30-90 | soil physics, soil chemistry, microbiological, molecularbiological |
| 21 | LD01-8049 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 90-160 | soil physics, soil chemistry, microbiological, molecularbiological |
| 22 | LD01-8050 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 160-170 | soil physics, soil chemistry, microbiological, molecularbiological |
| 23 | LD01-8051 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 170-190 | soil physics, soil chemistry, microbiological, molecularbiological |
| 24 | LD01-8052 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 190-240 | soil physics, soil chemistry, microbiological, molecularbiological |
| 25 | LD01-8053 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | soil sample, A-04, dry tundra, coastal cliff (site SDS4) | 240-320 | soil physics, soil chemistry, microbiological, molecularbiological |
| 26 | LD01-8353 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 5-13 | soil porosity |
| 27 | LD01-8354 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 5-13 | soil porosity |
| 28 | LD01-8355 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 5-13 | soil porosity |
| 29 | LD01-8356 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 5-13 | soil porosity |
| 30 | LD01-8357 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 5-13 | soil porosity |
| 31 | LD01-8358 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 13-20 | soil porosity |
| 32 | LD01-8359 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 13-20 | soil porosity |
| 33 | LD01-8360 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 13-20 | soil porosity |
| 34 | LD01-8361 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 13-20 | soil porosity |
| 35 | LD01-8362 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 13-20 | soil porosity |
| 36 | LD01-8363 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 20-35 | soil porosity |
| 37 | LD01-8364 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 20-35 | soil porosity |
| 38 | LD01-8365 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 20-35 | soil porosity |
| 39 | LD01-8366 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 20-35 | soil porosity |
| 40 | LD01-8367 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | soil sample, steel cylinder 100 cm3, A-02, moist tundra (site SDS1a) | 20-35 | soil porosity |
| 41 | LD01-8169 | 29.07.01 | Arga 73° 31,766' N 123° 25,309' E | vegetation sample, A-01, dry tundra (site SDS2) | | biomass determination |
| 42 | LD01-8170 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | vegetation sample, A-02, moist tundra (site SDS1a) | | biomass determination |
| 43 | LD01-8173 | 02.08.01 | Arga 73° 34,512' N 123° 21,815' E | vegetation sample, A-04, moss | | biomass determination, pollen (A. Andreiev) |
| 44 | LD01-8234 | 31.07.01 | Arga 73° 31,766' N 123° 25,309' E | vegetation sample, A-01, dry tundra (site SDS2) | | biomass determination |
| 45 | LD01-8235 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | vegetation sample, A-02, moist tundra (site SDS1a) | | biomass determination |
| 46 | LD01-8236 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | vegetation sample, A-02, moist tundra (site SDS1a) | | biomass determination |
| 47 | LD01-8237 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | vegetation sample, A-02, moist tundra (site SDS1a) | | biomass determination |

Table A7-4 (page 2): List of samples (total amount = 257), collected in the region Sanga-Dzhie / Babaryna-Belkee during the expedition Lena Delta 2001 (team 2).

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 48 | LD01-8237 | 31.07.01 | Arga 73° 31,735' N 123° 25,606 E | vegetation sample, wet tundra (site SDS1b) | | biomass determination |
| 49 | LD01-8208 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | sediment core, Ochugun-Nerpalakh Lake (site ONL2) | 0-30 | micromorphology |
| 50 | LD01-8209 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | sediment core, Ochugun-Nerpalakh Lake (site ONL2) | 0-30 | biogeochemistry |
| 51 | LD01-8210 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | sediment core, Ochugun-Nerpalakh Lake (site ONL2) | 0-30 | microbiological |
| 52 | LD01-8211 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | sediment core, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 0-50 | micromorphology |
| 53 | LD01-8212 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | sediment core, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 0-50 | biogeochemistry |
| 54 | LD01-8213 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | sediment core, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 0-50 | microbiological |
| 55 | LD01-8248 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 50 | CH4 content determination |
| 56 | LD01-8249 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 30 | CH4 content determination |
| 57 | LD01-8250 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 10 | CH4 content determination |
| 58 | LD01-8251 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 100 | CH4 content determination |
| 59 | LD01-8252 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 100 | CH4 content determination |
| 60 | LD01-8253 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 100 | CH4 content determination |
| 61 | LD01-8254 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 200 | CH4 content determination |
| 62 | LD01-8255 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 200 | CH4 content determination |
| 63 | LD01-8256 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 200 | CH4 content determination |
| 64 | LD01-8257 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 300 | CH4 content determination |
| 65 | LD01-8258 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 300 | CH4 content determination |
| 66 | LD01-8259 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 300 | CH4 content determination |
| 67 | LD01-8260 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 400 | CH4 content determination |
| 68 | LD01-8261 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 400 | CH4 content determination |
| 69 | LD01-8262 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 400 | CH4 content determination |
| 70 | LD01-8263 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 500 | CH4 content determination |
| 71 | LD01-8264 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 500 | CH4 content determination |
| 72 | LD01-8265 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 500 | CH4 content determination |
| 73 | LD01-8266 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 600 | CH4 content determination |
| 74 | LD01-8267 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 600 | CH4 content determination |
| 75 | LD01-8268 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 600 | CH4 content determination |
| 76 | LD01-8269 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 700 | CH4 content determination |
| 77 | LD01-8270 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 700 | CH4 content determination |
| 78 | LD01-8271 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 700 | CH4 content determination |
| 79 | LD01-8272 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 800 | CH4 content determination |
| 80 | LD01-8273 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 800 | CH4 content determination |
| 81 | LD01-8274 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 800 | CH4 content determination |
| 82 | LD01-8275 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 900 | CH4 content determination |
| 83 | LD01-8276 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 900 | CH4 content determination |
| 84 | LD01-8277 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 900 | CH4 content determination |
| 85 | LD01-8278 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1000 | CH4 content determination |
| 86 | LD01-8279 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1000 | CH4 content determination |
| 87 | LD01-8280 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1000 | CH4 content determination |
| 88 | LD01-8281 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1100 | CH4 content determination |
| 89 | LD01-8282 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1100 | CH4 content determination |
| 90 | LD01-8283 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1100 | CH4 content determination |
| 91 | LD01-8284 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1200 | CH4 content determination |
| 92 | LD01-8285 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1200 | CH4 content determination |
| 93 | LD01-8286 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample NaCl-saturated, Ochugun-Nerpalakh Lake (site ONL2) | 1200 | CH4 content determination |
| 94 | LD01-8287 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 50 | CH4 content determination |

Table A7-4 (page 3): List of samples (total amount = 257), collected in the region Sanga-Dzhie / Babaryna-Belkee during the expedition Lena Delta 2001 (team 2).

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 95 | LD01-8288 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 50 | CH4 content determination |
| 96 | LD01-8289 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 50 | CH4 content determination |
| 97 | LD01-8290 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 50 | CH4 content determination |
| 98 | LD01-8291 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 100 | CH4 content determination |
| 99 | LD01-8292 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 100 | CH4 content determination |
| 100 | LD01-8293 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 100 | CH4 content determination |
| 101 | LD01-8294 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 300 | CH4 content determination |
| 102 | LD01-8295 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 300 | CH4 content determination |
| 103 | LD01-8296 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 300 | CH4 content determination |
| 104 | LD01-8297 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 400 | CH4 content determination |
| 105 | LD01-8298 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 400 | CH4 content determination |
| 106 | LD01-8299 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 400 | CH4 content determination |
| 107 | LD01-8300 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 500 | CH4 content determination |
| 108 | LD01-8301 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 500 | CH4 content determination |
| 109 | LD01-8302 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 500 | CH4 content determination |
| 110 | LD01-8303 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 600 | CH4 content determination |
| 111 | LD01-8304 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 600 | CH4 content determination |
| 112 | LD01-8305 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 600 | CH4 content determination |
| 113 | LD01-8306 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 700 | CH4 content determination |
| 114 | LD01-8307 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 700 | CH4 content determination |
| 115 | LD01-8308 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 700 | CH4 content determination |
| 116 | LD01-8309 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 800 | CH4 content determination |
| 117 | LD01-8310 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 800 | CH4 content determination |
| 118 | LD01-8311 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 800 | CH4 content determination |
| 119 | LD01-8312 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 900 | CH4 content determination |
| 120 | LD01-8313 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 900 | CH4 content determination |
| 121 | LD01-8314 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 900 | CH4 content determination |
| 122 | LD01-8315 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 950 | CH4 content determination |
| 123 | LD01-8316 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 950 | CH4 content determination |
| 124 | LD01-8317 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 950 | CH4 content determination |
| 125 | LD01-8318 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 1000 | CH4 content determination |
| 126 | LD01-8319 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 1000 | CH4 content determination |
| 127 | LD01-8320 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample NaCl-saturated,, Sanga-Lake lagoon, "Ugly Laguna" (site UL) | 1000 | CH4 content determination |
| 128 | LD01-8321 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 50 | hydrochemistry |
| 129 | LD01-8322 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 100 | hydrochemistry |
| 130 | LD01-8323 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 200 | hydrochemistry |
| 131 | LD01-8324 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 300 | hydrochemistry |
| 132 | LD01-8325 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 400 | hydrochemistry |
| 133 | LD01-8326 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 500 | hydrochemistry |
| 134 | LD01-8327 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 600 | hydrochemistry |
| 135 | LD01-8328 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 700 | hydrochemistry |
| 136 | LD01-8329 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 800 | hydrochemistry |
| 137 | LD01-8330 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 900 | hydrochemistry |
| 138 | LD01-8331 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1000 | hydrochemistry |
| 139 | LD01-8332 | 25.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1100 | hydrochemistry |
| 140 | LD01-8333 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 50 | hydrochemistry |
| 141 | LD01-8334 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 100 | hydrochemistry |

Table A7-4 (page 4): List of samples (total amount = 257), collected in the region Sanga-Dzhie / Babaryna-Belkee during the expedition Lena Delta 2001 (team 2).

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 142 | LD01-8335 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 200 | hydrochemistry |
| 143 | LD01-8336 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 300 | hydrochemistry |
| 144 | LD01-8337 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 400 | hydrochemistry |
| 145 | LD01-8338 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 500 | hydrochemistry |
| 146 | LD01-8339 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 600 | hydrochemistry |
| 147 | LD01-8340 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 700 | hydrochemistry |
| 148 | LD01-8341 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 800 | hydrochemistry |
| 149 | LD01-8342 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 900 | hydrochemistry |
| 150 | LD01-8343 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1000 | hydrochemistry |
| 151 | LD01-8344 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1100 | hydrochemistry |
| 152 | LD01-8345 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1200 | hydrochemistry |
| 153 | LD01-8346 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1300 | hydrochemistry |
| 154 | LD01-8347 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1400 | hydrochemistry |
| 155 | LD01-8348 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, Ochugun-Nerpalakh Lake (site ONL2) | 1500 | hydrochemistry |
| 156 | LD01-8349 | 25.07.01 | Arga 73° 31,903' N 123° 27,277' E | water sample, Ochugun-Nerpalakh Lake (site ONL1) | 15 | hydrochemistry |
| 157 | LD01-8350 | 28.07.01 | Arga 73° 31,637' N 123° 28,271' E | water sample, small thermokarst lake (site SDS1d) | 30 | hydrochemistry |
| 158 | LD01-8351 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Ugly Laguna (site UL) | 15 | hydrochemistry |
| 159 | HH01-L1 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 50 | hydrochemistry |
| 160 | HH01-L2 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 200 | hydrochemistry |
| 161 | HH01-L3 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 300 | hydrochemistry |
| 162 | HH01-L4 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 500 | hydrochemistry |
| 163 | HH01-L5 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 600 | hydrochemistry |
| 164 | HH01-L6 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 700 | hydrochemistry |
| 165 | HH01-L7 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 800 | hydrochemistry |
| 166 | HH01-L8 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 900 | hydrochemistry |
| 167 | HH01-L9 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 1000 | hydrochemistry |
| 168 | HH01-L10 | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 1100 | hydrochemistry |
| 169 | HH01-Lgroun | 21.07.01 | Arga 73° 32,288' N 123° 26,076' E | surface sediment sample, Sanga-Lake lagoor | | mineralogy, chemistry |
| 170 | HH01-S1 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 10 | hydrochemistry |
| 171 | HH01-S2 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 100 | hydrochemistry |
| 172 | HH01-S3 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 200 | hydrochemistry |
| 173 | HH01-S4 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 300 | hydrochemistry |
| 174 | HH01-S5 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 400 | hydrochemistry |
| 175 | HH01-S6 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 500 | hydrochemistry |
| 176 | HH01-S7 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 600 | hydrochemistry |
| 177 | HH01-S8 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 700 | hydrochemistry |
| 178 | HH01-S9 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 800 | hydrochemistry |
| 179 | HH01-S10 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 900 | hydrochemistry |
| 180 | HH01-S11 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1000 | hydrochemistry |
| 181 | HH01-S12 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1100 | hydrochemistry |
| 182 | HH01-S13 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1200 | hydrochemistry |
| 183 | HH01-S14 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1300 | hydrochemistry |
| 184 | HH01-S15 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1400 | hydrochemistry |
| 185 | HH01-S16 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1500 | hydrochemistry |
| 186 | HH01-S17 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1600 | hydrochemistry |
| 187 | HH01-S18 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1700 | hydrochemistry |
| 188 | HH01-S19 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1800 | hydrochemistry |
| 189 | HH01-S20 | 29.07.01 | Arga 73°33,440'N 123°21,251'E | water sample, Sanga-Zhie lagoon | 1900 | hydrochemistry |
| 190 | HH01-N1 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 10 | hydrochemistry |
| 191 | HH01-N2 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 100 | hydrochemistry |
| 192 | HH01-N3 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 200 | hydrochemistry |
| 193 | HH01-N4 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 300 | hydrochemistry |

Table A7-4 (page 5): List of samples (total amount = 257), collected in the region Sanga-Dzhie / Babaryna-Belkee during the expedition Lena Delta 2001 (team 2).

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 194 | HH01-N5 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 400 | hydrochemistry |
| 195 | HH01-N6 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 500 | hydrochemistry |
| 196 | HH01-N7 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 600 | hydrochemistry |
| 197 | HH01-N8 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 700 | hydrochemistry |
| 198 | HH01-N9 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 800 | hydrochemistry |
| 199 | HH01-N10 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 900 | hydrochemistry |
| 200 | HH01-N11 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | water sample, Sanga-Lake lagoon | 950 | hydrochemistry |
| 201 | HH01-N1 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | suspended load, Sanga-Lake lagoon | 10 | chemistry, mineralogy |
| 202 | HH01-N6 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | suspended load, Sanga-Lake lagoon | 500 | chemistry, mineralogy |
| 203 | HH01-N9 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | suspended load, Sanga-Lake lagoon | 800 | chemistry, mineralogy |
| 204 | HH01-N10 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | suspended load, Sanga-Lake lagoon | 900 | chemistry, mineralogy |
| 205 | HH01-N11 | 28.07.01 | Arga 73° 32,288' N 123° 26,076' E | suspended load, Sanga-Lake lagoor | 950 | chemistry, mineralogy |
| 206 | HH01-BT1 | 25.07.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 230-240 | C-14 dating |
| 207 | HH01-BT2 | 25.07.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 190-200 | C-14 dating |
| 208 | HH01-BT3 | 25.07.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 150-160 | C-14 dating |
| 209 | HH01-BT4 | 25.07.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 80-90 | C-14 dating |
| 210 | HH01-30 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 0-30 | pollen |
| 211 | HH01-40 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 40 | pollen |
| 212 | HH01-50 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 50 | pollen |
| 213 | HH01-60 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 60 | pollen |
| 214 | HH01-70 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 70 | pollen |
| 215 | HH01-80 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 80 | pollen |
| 216 | HH01-90 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 90 | pollen |
| 217 | HH01-100 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 100 | pollen |
| 218 | HH01-110 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 110 | pollen |
| 219 | HH01-120 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 120 | pollen |
| 220 | HH01-130 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 130 | pollen |
| 221 | HH01-140 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 140 | pollen |
| 222 | HH01-150 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 150 | pollen |
| 223 | HH01-165 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 165 | pollen |
| 224 | HH01-180 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 180 | pollen |
| 225 | HH01-190 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 190 | pollen |
| 226 | HH01-200 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 200 | pollen |
| 227 | HH01-210 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 210 | pollen |
| 228 | HH01-220 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 220 | pollen |
| 229 | HH01-230 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 230 | pollen |
| 230 | HH01-270 | 02.08.01 | Arga 73°34.520´N 123°21.781´E | soil sample, Cape Babaryan Tumsa | 270 | pollen |
| 231 | HH01-SA1 | 27.07.01 | Arga 73°36.518´N 123°12.718´E | water sample surface + bottom sediment, profile Sargalakh | 1000 | chemistry, mineralogy |
| 232 | HH01-SA2 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 800 | chemistry, mineralogy |
| 233 | HH01-SA3 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 600 | chemistry, mineralogy |
| 234 | HH01-SA4 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 380 | chemistry, mineralogy |
| 235 | HH01-SA5 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 200 | chemistry, mineralogy |
| 236 | HH01-SA6 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 60 | chemistry, mineralogy |
| 237 | HH01-SN1 | 27.07.01 | Arga 73°31.128´N 123°09.832´E | water sample surface + bottom sediment, profile Sargalakh | 1000 | chemistry, mineralogy |
| 238 | HH01-SN2 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 800 | chemistry, mineralogy |
| 239 | HH01-SN3 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 600 | chemistry, mineralogy |
| 240 | HH01-SN4 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 400 | chemistry, mineralogy |
| 241 | HH01-SN5 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 200 | chemistry, mineralogy |
| 242 | HH01-SN6 | 27.07.01 | | water sample surface + bottom sediment, profile Sargalakh | 50 | chemistry, mineralogy |
| 243 | HH01-KW1 | 29.07.02 | Arga 73°33.065´N 123°10.661´E | water sample, profile Kanal | 850 | chemistry, mineralogy |
| 244 | HH01-KW2 | 29.07.02 | | water sample, profile Kanal | 700 | chemistry, mineralogy |
| 245 | HH01-KW3 | 29.07.02 | | water sample, profile Kanal | 500 | chemistry, mineralogy |
| 246 | HH01-KW4 | 29.07.02 | | water sample, profile Kanal | 300 | chemistry, mineralogy |
| 247 | HH01-KW5 | 29.07.02 | | water sample, profile Kanal | 100 | chemistry, mineralogy |

Table A7-4 (page 6): List of samples (total amount = 257), collected in the region Sanga-Dzhie / Babaryna-Belkee during the expedition Lena Delta 2001 (team 2).

| no. | sample ID | date | location | description | depth (cm) | planned analyses |
|---|---|---|---|---|---|---|
| 248 | HH01-KW6 | 29.07.02 | | water sample, profile Kanal | 100 | chemistry, mineralogy |
| 249 | HH01-KW7 | 29.07.02 | | water sample, profile Kanal | 350 | chemistry, mineralogy |
| 250 | HH01-KS1 | 29.07.02 | Arga 73°32.998´N 123°04.845, E | surface sediment, profile Kanal | 970 | chemistry, mineralogy |
| 251 | HH01-KS2 | 29.07.02 | | surface sediment, profile Kanal | 800 | chemistry, mineralogy |
| 252 | HH01-KS3 | 29.07.02 | | surface sediment, profile Kanal | 600 | chemistry, mineralogy |
| 253 | HH01-KS4 | 29.07.02 | | surface sediment, profile Kanal | 400 | chemistry, mineralogy |
| 254 | HH01-KS5 | 29.07.02 | | surface sediment, profile Kanal | 200 | chemistry, mineralogy |
| 255 | HH01-KS6 | 29.07.02 | | surface sediment, profile Kanal | 230 | chemistry, mineralogy |
| 256 | HH01-KS7 | 29.07.02 | | surface sediment, profile Kana | 460 | chemistry, mineralogy |
| 257 | HH01-W | 22.07.01 | Arga 73°34.302´N 123°14.121´E | wood sample, uppermost driftwood, Babaryna Island S-coas | | C-14 dating |

**Table A8-1 (page 1): MKh section, 2001. Description of sedimentary units and samples taken**

| Unit No | Depth, m | Alti-tude a.s.l., m | Sediment | Cryostructure | Macrofossil sample and its mean altitude a.s.l. | General (sediment) sample (depth and mean altitude a.s.l.) |
|---|---|---|---|---|---|---|
| **Bdzh. "P" (20-25 m SE of landmark R6 of 1999 [approximately the same as 4.6 of 1998].** | | | | | | |
| 1. | 0.0-0.3 | 38,9-38,6 | Soil, active layer | | | |
| 2. | 0.3-1.0 | 38,6-37,9 | Gray silt with scattered inclusions of poorly decomposed organic: mostly lenses at 0.4-0.5 m, and "spots" at 0.5-0.6 m. | Extremely high ice content | | 0,6 (38,3)<br>0,9 (38,0) |
| 3. | 1.0-2.2 | 37,9-36,7 | Gray silt with "hummock-like" peat inclusions. Peat "hummocks" are concentrated mostly at two quasi-horizontal levels: at 1.0-1.4 and 1.8-2.0 m depth. Peat is poorly decomposed and contains many thin (up to 2 mm) twigs. | High ice content | | 1,2 (37,7)<br>1,5 (37,4)<br>1,8 (37,1)<br>2.1 (36.8) |
| 4. | 2.2-2.9 | 36,7-36,0 | Gray silt | Reticulated and fine-*schlieren* | MKh-01-23: 36,5 m | 2,4 (36,5)<br>2,7 (36,2) |
| 5. | 2.9-3.9 | 36,0-35,0 | Silty sand, silt with lens-like horizontal-wavy lamination and inclusion of numerous thin roots (grass). Sand layers up to 0.5-1 cm thick. | Massive | MKh-01-21: 35,9 m | 3,0 (35,9)<br>3,2 (35,7) |
| P1. | 3.9-4.5 | 35,0-34,4 | Silt - contact zone with the "longitudinal" ice wedge (sub-parallel to the cliff) | High ice content in abundant small lenses (schlieren), oriented parallel to the ice wedge | | |
| **Bdzh. "O" (7-12 m SE of landmark R6 of 1999). The top of the Bdzh was 0.7 –1 m below the Yedoma surface on 24.07.01 and 2 m below it on 23.08.01.** | | | | | | |
| 3. | 0.9-2.0 | 38,0-36,9 | Silt, brownish-gray with "hummock-like" peat inclusions. Peat consists of moss and sedge (?) remains and includes woody roots or twigs up to 3 mm in diameter. | Siltwith reticulated microschlieren structure. Both peat and loam are crossed by the system of thick (2-7 mm) ice schlieren with clean transparent ice. | MKh-01-01: 37,6 m,<br>MKh-01-02: 37.3 m | 1,8 (37,1) |
| 4. | 2.0-2.7 | 36,9-36,2 | Sandy silt, gray. The unit has reasonably steep (up to 30°) profile in the upper part of the bdzh. | Reticulated and fine-*schlieren* cryogenic structure and a system of discontinuous thicker *schlieren* (up to 5 mm). | MKh-01-03: 36,4 m | |
| 5. | 2.7-4.0 | 36,2-34,9 | Silty sand, sandy silt with lens-like horizontal-wavy lamination and inclusion of numerous thin roots (grass). Sand layers up to 0.5-1 cm thick. In some lenses sand particles reach 2 mm in size. The unit forms steep profile (50-60°) in the bdzh. By thawin | Massive cryostructure. | MKh-01-22: 35,4 m | 3,3 (35,6)<br>3,6 (35,3)<br>3,9 (35,0) |

Table A8-1 (page 2): MKh section, 2001. Description of sedimentary units and samples taken

| Unit No | Depth, m | Alti-tude a.s.l., m | Sediment | Cryostructure | Macrofossil sample and its mean altitude a.s.l. | General (sediment) sample (depth and mean altitude a.s.l.) |
|---|---|---|---|---|---|---|
| 6. | 4.0-4.6 | 34,9-34,3 | Silt, sandy silt, gray, with numerous woody roots and thin (grass) rootlets. The unit forms very steep profile (50-60°) in the bdzh, up to negative incline. By thawing, the sediment of this unit fells down in narrow blocks, following the ice bands.* | Fine-reticulated, laminated, with a system of horizontal ice belts up to 2-3 cm thick. | | 4,2 (34,7)<br>4,5 (34,4)<br>4,6 (34,1) |
| NOTES: *This unit represents a visually notable member in this and other bdzhs: very steep or vertical wall with horizontal stratification. It makes impression of normal (lithological) stratification, with darker layers enriched with organic remains. | | | | | | |
| 7. | 4.6-8.2 | 34,3-30,7 | Silt, gray, no visible lamination, Organic inclusions (grass roots and woody roots and twigs) are rather common, but much less abundant than in the unit above. By thawing, the sediment of this unit does not form any melted blocks, but turns into liquid mu | Relatively high ice content. Cryostructure lens-like, wavy, laminated, microschlieren, with rather frequent individual thick bands below 5-5.2 m. | | 4,8 (34,1)<br>5,1 (33,8)<br>5,4 (33,5)<br>5,7 (33,2)<br>6,0 (32,9)<br>6,3 (32,6)<br>6,6 (32,3)<br>6,9 (32,0)<br>7,2 (31,7)<br>7,5 (31,4)<br>7,8 (31,1) |
| NOTES: **In this and other bdzkhs, this member is exposed at the base of the bdzkh, forming a rather steep wall, from which a series of subparallel (radiating) "ridges" starts. The "ridges" are formed by exposed frozen sediment, while along the "valleys" | | | | | | |
| O1. | 8.2-8.5 | 30,7-30,4 | Contact zone with the "longitudinal" ice wedge (sub-parallel to the cliff). In the lateral areas of this and other baydzerakhs (adjoining the ice wedges, exposed more or less normally to the cliff) the layers are curved upward. *** | Silt with high ice content in abundant small lenses (schlieren), oriented parallel to the ice wedge | | |
| NOTES: ***The contact zones with the ice wedges have higher ice content in abundant small lenses (schlieren), oriented almost vertically (parallel to the ice wedge). Thus, each bdzkh is bordered with the band of these contact zones with very high ice cont | | | | | | |
| **Bdzh. "S" (4-8 m NW of landmark R6 of 1999). At the beginning of our work (23.08.01) the Bdzh was crowned with a narrow peak, which was soon destroyed. When its description started (28.08.01), the top of the Bdzh was at 3.3 m below the Yedoma surface.** | | | | | | |

Table A8-1 (page 3): MKh section, 2001. Description of sedimentary units and samples taken

| Unit No | Depth, m | Altitude a.s.l., m | Sediment | Cryostructure | Macrofossil sample and its mean altitude a.s.l. | General (sediment) sample (depth and mean altitude a.s.l.) |
|---|---|---|---|---|---|---|
| 5+6* | 3.3-4.5 | 35,6-34,4 | Silt with the admixture of fine sand particles. Inclusion of woody roots and thin rootlets, with the organic-rich spots in the upper part of the unit. The unit forms a steep wall in the thawing bdzh, and has horizontally stratified appearance, which is vi | Cryogenic structure varies from the laminated lens-like wavy microschlieren to the massive one in the adjacent (alternating) layers | MKh-01-05: 35,4 m, MKh-01-04: 35,2 m | 3,6 (35,3) |
| NOTES: * (partially destroyed from the top) | | | | | | |
| 7. | 4.5-9.0 | 34,4-29,9 | Gray silt, unstratified, forming a long system of "ridges" on the thawing surface between upper and lower steep parts of bdzh "S". In the interval 5.7 - 7.0 m – silt with rare admixture of fine sand particles. Plant fragments up to 3 mm in diameter and ab | Alteration of layers with a lower ice content and fine-reticulated microschlieren or massive cryostructure, and the layers with a higher ice content. In the latter, continuous ice schlieren up to 1-5 mm thick in silt or ice bands up to 0.5-2 cm thick occu | MKh-01-06: 34,3 m, MKh-01-07: 33,3 m, MKh-01-08: 32,3 m, MKh-01-09: 31,3 m | 5,1 (33,8) 6,1 (32,8) 7,2 (31,7) 7,5 (31,4) 7,9 (31,8) |
| 8. | 9.0 - 9.8 | 29,9-29,1 | Silt with clear horizontal lamination, probably of cryogenic character. This unit forms a steep step on the face of the eroded bdzh. | Layers with closely laminated lens-like c/s alternate with those with massive microschlieren c/s. | MKh-01-10: 29,5 m | |
| 9a+ 9b. | 9.8 - 11.6 | 29,1-27,3 | Silt with higher ice content. The upper part of this unit is still within the steep step on the slope (up to the depth of ca 10.5 m), further down the unit forms the lower system of "ridges" of the bdzh "S". The lower part of the unit includes the contact | Every 5-10 cm in the profile horizontal ice bands are observed, alternating with the layers of silt with microschlieren lens-like wavy c/s. the thickness of ice lenses up to 3 mm. This structure is characteristic for at least upper 70 cm of the unit. | MKh-01-11: 28,4 m | |
| **Bdzh. "I" (between "O" and "S", but further down the slope - the third level of bdzkhs from the top,). The top mark of this bdzkh is accepted at 8,5 m depth from the top of the cliff.** | | | | | | |
| 7*. | 8.5-9.0 m - | 30,4-29,9 | Gray sandy silt with sand layers and lenses. The sand is gray, fine-grained, with some grains up to 1 mm. Sand lenses are of irregular shape. Thin rootlets and rare plant fragments (twigs). | C/s mostly massive in sand, lens-like wavy, closely laminated microschlieren in sandy silt, especially in the upper part of the unit. Horizontal ice schlieren up to 1-3 mm thick, not visible within sand lenses. | | |
| NOTES: * (partially destroyed from the top) | | | | | | |

Table A8-1 (page 4): MKh section, 2001. Description of sedimentary units and samples taken

| Unit No | Depth, m | Altitude a.s.l., m | Sediment | Cryostructure | Macrofossil sample and its mean altitude a.s.l. | General (sediment) sample (depth and mean altitude a.s.l.) |
|---|---|---|---|---|---|---|
| 8. | 9.0-9.8 | 29,9-29,1 | Silty loam with high ice content and rare plant fragments. This unit, together with the previous one, forms relatively steep slope in the upper part of the melting bdzkh. | Horizontal ice bands 1-4 cm thick and ice/silt bands, consisting of ice schlieren 3-5 mm thick. Silt between these bands has fine-reticulated microschlieren c/s. | | |
| 9. | 9.8-11.8 - | 29,1-27,1 | Gray silt with high ice content. The unit contains fragments of woody plant roots up to 3 mm in diameter and abundant long thin rootlets (grass). In the lower part of the unit the spots of poorly decomposed organic material (peat) up to 2-5 cm in size app | Every 5-10 cm – ice/silt bands 0.5-1 cm thick. Between them the cryostructure changes in alternating micro-layers from fine-reticulated microschlieren to cell-like reticulated microschlieren. Within the "ridges", the c/s is reticulated and slightly differ | MKh-01-15: 27,9 m, MKh-01-15a: 27,6 m | |
| 10. | 11.8-12.2 | 27,1-26,7 | Gray silty fine sand, intercalating with silt. In the upper part of the unit sand grains up to 1 mm. Abundant grass roots and woody plant roots up to 3 mm in diameter, lightly colored at the cross-section; some are surrounded with the spots of dark organi | C/s mostly massive, in silt layers – fine reticulated. Thin ice bands (up to 1 mm) are observed every 5-10 cm across the unit. | | |
| 11. | 12.2-12.8 | 26,7-26,1 | Gray-brownish silt with a stratified appearance, forms a vertical step on the slope of the thawing bdzkh. Stratification is visually caused by a rhythmic alteration of layers with different cryogenic structure. The unit contains abundant woody plant fragm | The layers with massive or lens-like microschlieren c/s (less ice content) 2-3 cm thick intercalate with ice-saturated layers. The latter have closely-laminated microschlieren c/s with the ice schlieren up to 2 mm thick, growing up to 3-10 mm to the botto | MKh-01-14: 26,6 m | |
| 12. | 12.8-14.2 | 26,1-24,7 | Gray silt with high ice content. In the upper part of the interval, still on a relatively steep wall, it has stratified appearance as well, but looks and thaws differently from Unit 12. At the depth about 13.3 m the next system of sub-parallel "ridges" st | | MKh-01-13: 25,9 m, MKh-01-12: 24,9 m | |
| 13. | 14.2-17.7 | 24,7-21,2 | Gray silt with a rhythmic cryogenic structure. Between 15 and 16.5 m all ridges form a short steeper step, looking as another possible "paleosol". The lower part of the unit includes the contact zone with the longitudinal ice wedge. | Continuous horizontal ice bands up to 2 cm thick occur every ca 15 cm. Silt between them has fine-reticulated, horizontally oriented microschlieren c/s. Small organic spots are restricted mostly to the "ridges" | MKh-01-20: 23,8 m, MKh-01-19: 22,8 m | |
| **Bdzh. "KS" (below "O", corresponds in altitude to the lower part of bdzkh "I" The top mark of this bdzkh is accepted at 15,5 m depth from the top of the cliff.** | | | | | | |

**Table A8-1 (page 5): MKh section, 2001. Description of sedimentary units and samples taken**

| Unit No | Depth, m | Altitude a.s.l., m | Sediment | Cryostructure | Macrofossil sample and its mean altitude a.s.l. | General (sediment) sample (depth and mean altitude a.s.l.) |
|---|---|---|---|---|---|---|
| KS1 | 15.5-15.9 | 23,4-23,0 | Gray-brownish silt with rare fine sand particles, with thin rootlets and woody plant roots up to 3-4 mm in diameter, surrounded by dark organic spots. | | | |
| KS2 | 15.9-18.0 | 23,0-20,9 | Silt with high ice content.. | Ice/silt and clear ice bands, horizontal on the face of the bdzkh, are strongly tilted upward near the ice wedge | | |
| KS3 | 18.0-18.2 | 20,9-20,7 | Silty sand with organic (peat) spots and woody root fragments, intercalating with Silt. | Massive cryostructure in sand. | | |
| KS4 | 18.2-20.0 | 20,7-18,9 | Silt, below is the ice wedge. | | | |
| **Bdzh. "W" (SE of KS, overlaps in altitude with the lower part of bdzkh "KS" The top mark of this bdzkh is accepted at 18,0 m depth from the top of the cliff.** | | | | | | |
| W1 | 18.0-18.8 | 20,9-20,1 | Gray silt, sandy silt. Forms the top of the bdzkh (under destruction). | | | |
| W2 | 18.8-20.0 | 20,1-18,9 | Brownish silt with abundant long interweaving woody roots and associated twiggy rootlets. Forms a steep slope of the bdzkh and looks like "paleosol". | | MKh-01-16: 19,8 m | |
| W3 | 20.0-20.5 | 18,9-18,4 | Gray silt, forms the "ridges", starting below the steep part of the bdzkh. Still includes some twigs. No detailed description. | | MKh-01-17: 18,8 m | |
| **Bdzkh "Z" down to the seafront from "W". No detailed description.** | | | | | | |
| Z1 | 20.8-21,1 | 18,1-17,8 | Gray silt (the top of bdzkh under destruction) | | | |
| Z2 | 21,1-22,0 | 17,8-16,9 | Silt with abundant twigs | | MKh-01-18: 17,5 m | |
| Z3 | 22,0-23,0 | 16,9-15,9 | Gray silt with higher ice content. | | | |

**Table A8-2: List of macrofossil samples**

| Sample No | Location | Depth in the profile (top) | Depth in the profile (base) | Depth (mean) | Altitude (38.9 m at "zero" mark) | Sediment description |
|---|---|---|---|---|---|---|
| MKh-01-01 | Baydzh. "O", the top | 1,15 | 1,4 | 1,3 | 37,6 | Peat |
| MKh-01-02 | Baydzh. "O", the upper part | 1,5 | 1,7 | 1,6 | 37,3 | Peat |
| MKh-01-03 | Baydzh. "O", the upper part | 2,35 | 2,6 | 2,5 | 36,4 | Silty sand |
| MKh-01-04 | Baydzh. "S", steep slope | 3,6 | 3,9 | 3,7 | 35,2 | Silty sand |
| MKh-01-04a | Baydzh. "S", steep slope | 3,4 | 3,8 | 3,6 | 35,3 | Silty sand |
| MKh-01-05 | Baydzh. "S", the top (steep slope) | 3,3 | 3,7 | 3,5 | 35,4 | Silty sand |
| MKh-01-06 | Baydzh. "S", the base of the steep slope | 4,5 | 4,8 | 4,7 | 34,3 | Silty sand |
| MKh-01-07 | Baydzh. "S", the step on the upper third of the ridge | 5,5 | 5,7 | 5,6 | 33,3 | Silt |
| MKh-01-07a | Baydzh. "S", the step on the upper third of the ridge | 5,7 | 5,9 | 5,8 | 33,1 | Silt |
| MKh-01-08 | Baydzh. "S", the step in the middle of the ridge | 6,5 | 6,7 | 6,6 | 32,3 | Silt |
| MKh-01-09, 9a | Baydzh. "S", the lower part of the ridge above the lower steep slope on top of the ice wedge | 7,5 | 7,8 | 7,7 | 31,3 | Silt with "stratified" cryostructure (lens-like) and woody roots |
| MKh-01-09b | Baydzh. "S", the lower part of the ridge above the lower steep slope on top of the ice wedge | 8,7 | 8,9 | 8,8 | 30,1 | Silt |
| MKh-01-10 | Baydzh. "S", lower steep slope | 9,3 | 9,6 | 9,5 | 29,5 | Silt |
| MKh-01-10a | Baydzh. "S", lower steep slope | 9,5 | 9,8 | 9,7 | 29,3 | Silt |
| MKh-01-11 | Baydzh. "S", the upper part of the ridges beneath the lower steep slope | 10,4 | 10,7 | 10,6 | 28,4 | Silt |
| MKh-01-12 | Baydzh. "I", the ridges beneath the lower steep slope | 13,9 | 14,2 | 14,1 | 24,9 | Silt |
| MKh-01-13 | Baydzh. "I", the base of the lower steep slope | 12,9 | 13,2 | 13,1 | 25,9 | Silt |
| MKh-01-14 | Baydzh. "I", the upper part of the vertical steep slope | 12,2 | 12,5 | 12,4 | 26,6 | Silt |
| MKh-01-15 | Baydzh. "I", the top of the vertical steep slope | 10,9 | 11,2 | 11,1 | 27,85 | Silt |
| MKh-01-15a | Baydzh. "I", the top of the vertical steep slope | 11,2 | 11,4 | 11,3 | 27,6 | Silt with peat inclusions |
| MKh-01-16 | Baydzh. "W", the middle part | 19,0 | 19,2 | 19,1 | 19,8 | Silt with abundant woody roots and twigs |
| MKh-01-17 | Baydzh. "W", the middle part | 20 | 20,3 | 20,2 | 18,75 | Silt with abundant woody roots and twigs |
| MKh-01-18 | Baydzh. "Z", the middle part | 21,3 | 21,6 | 21,5 | 17,45 | Silt with abundant woody roots and twigs |
| MKh-01-19 | Baydzh. "I", the lower part | 16 | 16,3 | 16,2 | 22,75 | Silt |
| MKh-01-20 | Baydzh. "I", the lower part | 15 | 15,3 | 15,2 | 23,75 | Silt |
| MKh-01-21 | Baydzh. "P", the middle part | 2,9 | 3,2 | 3,1 | 35,85 | Sand |
| MKh-01-21a | Baydzh. "P", the middle part | 3 | 3,3 | 3,2 | 35,75 | Sand |
| MKh-01-22 | Baydzh. "O", the upper part | 3,3 | 3,7 | 3,5 | 35,4 | Sand |
| MKh-01-23 | Baydzh. "P", the upper part, under the peat cover | 2,3 | 2,6 | 2,5 | 36,45 | Silt |

**Table A8-3: List of sediment samples**

| Sample No | Location | Depth, m. | Altitude (38.9 m at "zero" mark) | Sediment description |
|---|---|---|---|---|
| MKh-S-01 | Baydzh. "P", Unit 2 | 0,6 | 38,3 | silt with ataxite cryostructure |
| MKh-S-02 | Baydzh. "P", Unit 2 | 0,9 | 38,0 | peat inclusion |
| MKh-S-03 | Baydzh. "P", Unit 3 | 1,2 | 37,7 | silt above the "peat hummocks" layer |
| MKh-S-04 | Baydzh. "P", Unit 3 | 1,5 | 37,4 | silt between peat hummocks |
| MKh-S-05 | Baydzh. "P", Unit 3 | 1,8 | 37,1 | silt |
| MKh-S-06 | Baydzh. "P", Unit 3 | 2,1 | 36,8 | silt |
| MKh-S-07 | Baydzh. "P", Unit 4 | 2,4 | 36,5 | silt |
| MKh-S-08 | Baydzh. "P", Unit 4 | 2,7 | 36,2 | silt above the contact with sand |
| MKh-S-09 | Baydzh. "P", Unit 5 | 3,0 | 35,9 | sand layer, upper part |
| MKh-S-10 | Baydzh. "P", Unit 5 | 3,2 | 35,7 | stratified sand/silt |
| MKh-S-11 | Baydzh. "O", Unit 5 | 3,3 | 35,6 | stratified sand/silt |
| MKh-S-12 | Baydzh. "O", Unit 5 | 3,6 | 35,3 | stratified sand/silt |
| MKh-S-13 | Baydzh. "O", Unit 5 | 3,9 | 35,0 | stratified sand/silt |
| MKh-S-14 | Baydzh. "O", Unit 6 | 4,2 | 34,7 | stratified silt |
| MKh-S-15 | Baydzh. "O", Unit 6 | 4,5 | 34,4 | stratified silt |
| MKh-S-16 | Baydzh. "O", Unit 6 | 4,6 | 34,3 | stratified silt, the foot of massive stratified zone |
| MKh-S-17 | Baydzh. "O", Unit 7 | 4,8 | 34,1 | silt with high ice content, still on the steep wall |
| MKh-S-18 | Baydzh. "O", Unit 7 | 5,1 | 33,8 | silt with high ice content, beginning of the "ridges" |
| MKh-S-19 | Baydzh. "O", Unit 7 | 5,4 | 33,5 | silt with high ice content |
| MKh-S-20 | Baydzh. "O", Unit 7 | 5,7 | 33,2 | silt with high ice content |
| MKh-S-21 | Baydzh. "O", Unit 7 | 6,0 | 32,9 | silt with high ice content |
| MKh-S-22 | Baydzh. "O", Unit 7 | 6,3 | 32,6 | silt with high ice content |
| MKh-S-23 | Baydzh. "O", Unit 7 | 6,6 | 32,3 | silt with high ice content |
| MKh-S-24 | Baydzh. "O", Unit 7 | 6,9 | 32,0 | silt with high ice content |
| MKh-S-25 | Baydzh. "O", Unit 7 | 7,2 | 31,7 | silt with high ice content |
| MKh-S-26 | Baydzh. "O", Unit 7 | 7,5 | 31,4 | silt with high ice content |
| MKh-S-27 | Baydzh. "O", Unit 7 | 7,8 | 31,1 | silt with high ice content |
| MKh-S-28 | Baydzh. "O", Unit 7 | 8,1 | 30,8 | silt with high ice content |
| Mkh-01s-01k | Baydzh. "O", Unit 2 | 1,8 | 37,1 | peat |
| Mkh-01s-05 | Baydzh. "S", Unit 7 | 7,5 | 31,4 | silt with high ice content |
| Mkh-01s-07 | Baydzh. "S", Unit 5 | 3,6 | 35,3 | silt with high ice content |
| Mkh-01s-08 | Baydzh. "S", Unit 7 | 5,1 | 33,9 | silt with high ice content |
| Mkh-01s-09 | Baydzh. "S", Unit 7 | 6,1 | 32,9 | silt with high ice content |
| Mkh-01s-10 | Baydzh. "S", Unit 7 | 7,2 | 31,7 | silt with high ice content |
| Mkh-01s-11, 11a | Baydzh. "S", Unit 7 | 7,9 | 31,1 | silt with high ice content |

Table A8-4: Description of ice in the ice wedge transects for isotope sampling

| Distance from the left edge of the ice wedge transect, in cm | Description of ice |
|---|---|
| **Transect MKh-01-1, NW of baydzherakh "S", depth 10 m. The main orientation of the transect is 320°, of the ice wedge (by the strike of the stripes) - 280°. The ice is clean, transparent, with rounded gas bubbles, mostly 1-2 mm in diameter, with evident parallel stripes, built with light-gray mud inclusions.** | |
| 10-20 | Ca 18 mud stripes in 10 cm |
| 25-35 | Ca 22 mud stripes in 10 cm, each is 1 mm thick or less, together with clear ice one rhythm is about 2-4 mm. |
| 70-90 | Milky-white ice |
| 90-100 | discontinuous silt inclusions up to 2 mm in size |
| **Transect MKh-01-2, S of baydzherakh "O", average depth 7 m. The main orientation of the ice wedge (by the strike of the stripes) - 195°. The ice is clean, transparent, saturated with rounded gas bubbles, with vertical stripes. The width of milky-white stripes is less than 1 mm, of the transparent ones - 2-4 mm.** | |
| 0-10 | 26 stripes of white ice, separated by transparent ones. At 9 cm - a crack, oriented at 215°, inclined to the wedge at the degree of 70°. |
| 10-40 | Milky-white ice because of the saturation with gaz bubbles. Additional cracks like in the prefious segment. |
| 40-180 | The main orientation is 210°,additional - 180°. The areas of transparent dark ice prevail, the stripes of gray mud (up to 3 mm width). At 59 cm - the third system of cracks appear (225° strike, 70° inclination). At 90 cm - silt xenolith with sand grains (up to 1 mm), 50x8 mm in size, crosses the cracks. |
| 180-210 | Milky-white ice. Inclusions of mineral mud along the cracks, very thin (below 1 mm). Between 155 and 160 cm - 8 stripes in 3 cm, between 175 and 180 cm - 6 stripes in 2,5 cm. |
| 210-270 | Alteration of milky-white and gray with dark ice. Dark ice stripes are 2-4 cm thick, and have essential admixture of mineral particles, concentrated along the stripes. Their main orientation is 245°, inclination 70°. |
| 270- | Stripping zone, forms a "hill" on the wedge surface. |
| 225-230 | Black stripe 2-4 mm thick,of mineral-organic inclusion, consists of 2-3 elementary stripes. |
| 245-250 | Black stripe 2 cm thick,of mineral-organic inclusion, consists of elementary veins with fine sand and plant remains. |
| 255-260 | 10 stripes in 3,5 cm |
| 310-315 | 8 stripes in 4 cm |
| 440 | The edge of the ice wedge. |

**Table A8-5: List of ice wedge samples for isotope study**

| Sample No | Distance from the left edge of the ice wedge transect, in cm | Sample No | Distance from the left edge of the ice wedge transect, in cm | Sample No | Distance from the left edge of the ice wedge transect, in cm |
|---|---|---|---|---|---|
| **Transect MKh-01-1, NW of baydzherakh "S", depth 10 m.** | | **Transect MKh-01-2, S of baydzherakh "O", average depth 7 m.** | | **Transect MKh-01-3A, ice wedge from below the active layer, narrow "waist", depth 1,3 m.** | |
| MKh-01-1-00 | 0 | MKh-01-2-10 | 10 | MKh-01-3A-10 | 10 |
| MKh-01-1-10 | 10 | MKh-01-2-20 | 20 | MKh-01-3A-20 | 20 |
| MKh-01-1-20 | 20 | MKh-01-2-30 | 30 | MKh-01-3A-30 | 30 |
| MKh-01-1-30 | 30 | MKh-01-2-40 | 40 | MKh-01-3A-40 | 40 |
| MKh-01-1-40 | 40 | MKh-01-2-50 | 50 | MKh-01-3A-50 | 50 |
| MKh-01-1-50 | 50 | MKh-01-2-60 | 60 | MKh-01-3A-60 | 60 |
| MKh-01-1-60 | 60 | MKh-01-2-80 | 80 | MKh-01-3A-70 | 70 |
| MKh-01-1-70 | 70 | MKh-01-2-90 | 90 | MKh-01-3A-80 | 80 |
| MKh-01-1-80 | 80 | MKh-01-2-100 | 100 | MKh-01-3A-90 | 90 |
| MKh-01-1-90 | 90 | MKh-01-2-110 | 110 | MKh-01-3A-100 | 100 |
| MKh-01-1-100 | 100 | MKh-01-2-120 | 120 | MKh-01-3A-110 | 110 |
| MKh-01-1-110 | 110 | MKh-01-2-130 | 130 | **Total: 11 samples** | |
| MKh-01-1-120 | 120 | MKh-01-2-140 | 140 | | |
| MKh-01-1-130 | 130 | MKh-01-2-150 | 150 | **Transect MKh-01-3B, ice wedge from below the active layer, widening lower part, depth 3,0 m** | |
| MKh-01-1-140 | 140 | MKh-01-2-160 | 160 | | |
| MKh-01-1-150 | 150 | MKh-01-2-170 | 170 | | |
| MKh-01-1-160 | 160 | MKh-01-2-180 | 180 | | |
| MKh-01-1-170 | 170 | MKh-01-2-190 | 190 | | |
| MKh-01-1-180 | 180 | MKh-01-2-200 | 200 | MKh-01-3B-10 | 10 |
| MKh-01-1-190 | 190 | MKh-01-2-210 | 210 | MKh-01-3B-20 | 20 |
| MKh-01-1-200 | 200 | MKh-01-2-220 | 220 | MKh-01-3B-30 | 30 |
| MKh-01-1-210 | 210 | MKh-01-2-230 | 230 | MKh-01-3B-40 | 40 |
| MKh-01-1-220 | 220 | MKh-01-2-240 | 240 | MKh-01-3B-50 | 50 |
| MKh-01-1-230 | 230 | MKh-01-2-250 | 250 | MKh-01-3B-60 | 60 |
| MKh-01-1-240 | 240 | MKh-01-2-260 | 260 | MKh-01-3B-70 | 70 |
| MKh-01-1-250 | 250 | MKh-01-2-270 | 270 | MKh-01-3B-80 | 80 |
| MKh-01-1-260 | 260 | MKh-01-2-280 | 280 | MKh-01-3B-90 | 90 |
| MKh-01-1-280 | 280 | MKh-01-2-290 | 290 | MKh-01-3B-100 | 100 |
| MKh-01-1-290 | 290 | MKh-01-2-300 | 300 | MKh-01-3B-110 | 110 |
| MKh-01-1-300 | 300 | MKh-01-2-310 | 310 | MKh-01-3B-120 | 120 |
| MKh-01-1-310 | 310 | MKh-01-2-320 | 320 | MKh-01-3B-130 | 130 |
| MKh-01-1-320 | 320 | MKh-01-2-330 | 330 | MKh-01-3B-140 | 140 |
| MKh-01-1-330 | 330 | MKh-01-2-340 | 340 | **Total: 14 samples** | |
| MKh-01-1-340 | 340 | MKh-01-2-350 | 350 | | |
| MKh-01-1-350 | 350 | MKh-01-2-360 | 360 | **Transect MKh-01-4, modern ice wedge (with a stock), depth 1,0 m** | |
| MKh-01-1-360 | 360 | MKh-01-2-370 | 370 | | |
| MKh-01-1-380 | 380 | MKh-01-2-380 | 380 | | |
| MKh-01-1-390 | 390 | MKh-01-2-390 | 390 | | |
| MKh-01-1-400 | 400 | MKh-01-2-400 | 400 | MKh-01-4-10 | 10 |
| MKh-01-1-410 | 410 | **Total: 39 samples** | | MKh-01-4-20 | 20 |
| MKh-01-1-420 | 420 | | | MKh-01-4-30 | 30 |
| MKh-01-1-430 | 430 | | | MKh-01-4-40 | 40 |
| MKh-01-1-440 | 440 | | | **Total: 4 samples** | |
| **Total: 43 samples** | | | | | |

Table A8-6 (page 1): List of mammal bones collected on Bykovsky Peninsula in 2001

| Data-base No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 1 | MKh-01-001 | Mammuthus primigenius (Blum.) | pelvis juv. | fragment | b | MKh, upper part of the thermoterrace, NW from the lighthouse, dry mud | ca 20 m |
| 2 | MKh-01-002 | Rangifer tarandus (L.) | pelvis | fragment | b | MKh, ca Stn. 470, in mud | 16-18 m |
| 3 | MKh-01-003 | Rangifer tarandus (L.) | costae | fragment | b | MKh, ca Stn. 450, in mud flow beneath baydzherakh | 18-19 m |
| 4 | MKh-01-004 | Rangifer tarandus (L.) | costae | fragment | b | MKh, ca Stn. 450, in mud flow beneath baydzherakh | 18-19 m |
| 5 | MKh-01-005 | Rangifer tarandus (L.) | costae | fragment | b | MKh, ca Stn. 450, in mud flow beneath baydzherakh | 18-19 m |
| 6 | MKh-01-006 | Equus caballus L. | femur (diaphysis) | fragment | a | MKh, Stn. 820, baydzherakh "KS" | 23 m |
| 7 | MKh-01-007 | Mammuthus sp. | epistropheus | damaged | b | MKh, ca Stn. 500 | ca 14 m |
| 8 | MKh-01-008 | Bison priscus (Boj.) | cranium | two fragments | b | MKh, ca Stn. 520 | ca 18 m |
| 9 | MKh-01-009 | Equus caballus L. | femur (diaphysis) | damaged | b | | |
| 10 | MKh-01-010 | Equus caballus L. | tibia | fragment | a | MKh, ca Stn. 780, baydzherakh next (NW) to "I", depth ca 15 m | 24 m |
| 11 | MKh-01-011 | Lepus sp. | tibia | complete | a | MKh, Stn. 850, depth 5,5 m | 33,5 m |
| 12 | MKh-01-012 | Lepus sp. | metapodial | complete | a | MKh, Stn. 850, depth 5,5 m | 33,5 m |
| 13 | MKh-01-013 | Lepus sp. | metapodial | complete | a | MKh, Stn. 850, depth 5,5 m | 33,5 m |
| 14 | MKh-01-014 | Lepus sp. | phalanx | complete | a | MKh, Stn. 850, depth 5,5 m | 33,5 m |
| 15 | MKh-01-015 | Lepus sp. | phalanx | complete | a | MKh, Stn. 850, depth 5,5 m | 33,5 m |
| 16 | MKh-01-016 | Lepus sp. | cranium | fragment | b | MKh, Stn.900, upper part of the section | |
| 17 | MKh-01-017 | Lepus sp. | pelvis | fragment | a | MKh, Stn. 820, baydzherakh "KS", below the deformed layers at the contact with ice wedge | 22 m |
| 18 | MKh-01-018 | Artiodactyla | tibia juv. | fragment | b | MKh, Stn.900, upper part of the section | |
| 19 | MKh-01-099 | Canis sp. | upper molar tooth | complete | d | MKh shore and bar | |
| 20 | MKh-01-100 | Lepus sp. | humerus | fragment | d | MKh shore and bar | |
| 21 | MKh-01-101 | Lepus sp. | scapula | fragment | d | MKh shore and bar | |
| 22 | MKh-01-102 | Lepus sp. | ? | fragment | d | MKh shore and bar | |

Table A8-6 (page 2): List of mammal bones collected on Bykovsky Peninsula in 2001

| Data-base No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 23 | MKh-01-103 | Lepus sp. | metapodial | fragment | d | MKh shore and bar | |
| 24 | MKh-01-104 | Lepus sp. | pelvis | fragment | d | MKh shore and bar | |
| 25 | MKh-01-105 | Lepus sp. | scapula | fragment | d | MKh shore and bar | |
| 26 | MKh-01-106 | Lepus sp. | phalanx | fragment | d | MKh shore and bar | |
| 27 | MKh-01-107 | Lepus sp. | scapula | fragment | d | MKh shore and bar | |
| 28 | MKh-01-108 | Lepus sp. | cranium | fragment | d | MKh shore and bar | |
| 29 | MKh-01-109 | Lepus sp. | madibula | fragment | d | MKh shore and bar | |
| 30 | MKh-01-110 | Lepus sp. | femur | fragment | d | MKh shore and bar | |
| 31 | MKh-01-111 | Lepus sp. | vert. cervic. | fragment | d | MKh shore and bar | |
| 32 | MKh-01-112 | Lepus sp. | cranium | fragment | d | MKh shore and bar | |
| 33 | MKh-01-113 | Lepus sp. | humerus | fragment | d | MKh shore and bar | |
| 34 | MKh-01-120 | Mammuthus primigenius (Blum.) | teeth pd4-M2 | anterior fragments | d | MKh shore and bar | |
| 35 | MKh-01-121 | Mammuthus primigenius (Blum.) | teeth pd4-M2 | anterior fragments | d | MKh shore and bar | |
| 36 | MKh-01-122 | Mammuthus primigenius (Blum.) | teeth pd4-M2 | anterior fragments | d | MKh shore and bar | |
| 37 | MKh-01-123 | Mammuthus primigenius (Blum.) | teeth pd4-M2 | anterior fragments | d | MKh shore and bar | |
| 38 | MKh-01-124 | Mammuthus primigenius (Blum.) | Lower tooth M1-2 | fragment | d | MKh shore and bar | |
| 39 | MKh-01-125 | Mammuthus primigenius (Blum.) | tooth | fragment | d | MKh shore and bar | |
| 40 | MKh-01-126 | Mammuthus primigenius (Blum.) | upper tooth M2-3 | fragment | d | MKh shore and bar | |
| 41 | MKh-01-127 | Mammuthus primigenius (Blum.) | tooth lower M3 | fragment | d | MKh shore and bar | |
| 42 | MKh-01-128 | Mammuthus primigenius (Blum.) | removed worn tooth | fragment | d | MKh shore and bar | |
| 43 | MKh-01-129 | Mammuthus primigenius (Blum.) | removed worn tooth | fragment | d | MKh shore and bar | |
| 44 | MKh-01-130 | Mammuthus primigenius (Blum.) | removed worn tooth | fragment | d | MKh shore and bar | |
| 45 | MKh-01-131 | Mammuthus primigenius (Blum.) | tooth | fragment | d | MKh shore and bar | |
| 46 | MKh-01-132 | Mammuthus primigenius (Blum.) | tooth | fragment | d | MKh shore and bar | |
| 47 | MKh-01-133 | Mammuthus primigenius (Blum.) | tooth M1-2 | fragment | d | MKh shore and bar | |
| 48 | MKh-01-134 | Mammuthus primigenius (Blum.) | removed worn tooth | fragment | d | MKh shore and bar | |
| 49 | MKh-01-135 | Mammuthus primigenius (Blum.) | tusk | fragment | d | MKh shore and bar | |
| 50 | MKh-01-139 | Mammuthus primigenius (Blum.) | fibula (distal end) | fragment | d | MKh shore and bar | |
| 51 | MKh-01-140 | Mammuthus primigenius (Blum.) | humerus juv. | fragment | d | MKh shore and bar | |
| 52 | MKh-01-141 | Mammuthus primigenius (Blum.) | carpal bone | fragment | d | MKh shore and bar | |
| 53 | MKh-01-142 | Mammuthus primigenius (Blum.) | carpal bone | fragment | d | MKh shore and bar | |

Table A8-6 (page 3): List of mammal bones collected on Bykovsky Peninsula in 2001

| Data-base No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 54 | MKh-01-143 | Mammuthus primigenius (Blum.) | metapodial | fragment | d | MKh shore and bar | |
| 55 | MKh-01-144 | Mammuthus primigenius (Blum.) | tibia | fragment | d | MKh shore and bar | |
| 56 | MKh-01-145 | Mammuthus primigenius (Blum.) | carpal bone | fragment | d | MKh shore and bar | |
| 57 | MKh-01-146 | Mammuthus primigenius (Blum.) | costae | fragment | d | MKh shore and bar | |
| 58 | MKh-01-147 | Mammuthus primigenius (Blum.) | tooth lower M3 | damaged | e | Cape Mamont, shore and bar | |
| 59 | MKh-01-148 | Mammuthus primigenius (Blum.) | tooth lower M3 | fragment | e | Cape Mamont, shore and bar | |
| 60 | MKh-01-149 | Mammuthus primigenius (Blum.) | tooth lower M3 | fragment | e | Cape Mamont, shore and bar | |
| 61 | MKh-01-150 | Mammuthus primigenius (Blum.) | tooth lower M3 | fragment | e | Cape Mamont, shore and bar | |
| 62 | MKh-01-151 | Mammuthus primigenius (Blum.) | tooth lower M3 | fragment | e | Cape Mamont, shore and bar | |
| 63 | MKh-01-152 | Mammuthus primigenius (Blum.) | tooth lower M2-3 | fragment | e | Cape Mamont, shore and bar | |
| 64 | MKh-01-153 | Mammuthus primigenius (Blum.) | tooth lower M1-2 worn | fragment | e | Cape Mamont, shore and bar | |
| 65 | MKh-01-154 | Mammuthus primigenius (Blum.) | tooth lower M1 | fragment | e | Cape Mamont, shore and bar | |
| 66 | MKh-01-155 | Mammuthus primigenius (Blum.) | atlas | damaged | e | Cape Mamont, shore and bar | |
| 67 | MKh-01-156 | Mammuthus primigenius (Blum.) | vert. lumb. | fragment | e | Cape Mamont, shore and bar | |
| 68 | MKh-01-157 | Mammuthus primigenius (Blum.) | vertebris | fragment | e | Cape Mamont, shore and bar | |
| 69 | MKh-01-158 | Mammuthus primigenius (Blum.) | scapula | fragment | e | Cape Mamont, shore and bar | |
| 70 | MKh-01-159 | Mammuthus primigenius (Blum.) | metapodial | fragment | e | Cape Mamont, shore and bar | |
| 71 | MKh-01-160 | Mammuthus primigenius (Blum.) | calcaneus | fragment | e | Cape Mamont, shore and bar | |
| 72 | MKh-01-161 | Mammuthus primigenius (Blum.) | femur | fragment | e | Cape Mamont, shore and bar | |
| 73 | MKh-01-162 | Mammuthus primigenius (Blum.) | tibia | fragment | e | Cape Mamont, shore and bar | |
| 74 | MKh-01-163 | Mammuthus primigenius (Blum.) | pelvis | fragment | e | Cape Mamont, shore and bar | |
| 75 | MKh-01-164 | Mammuthus primigenius (Blum.) | pelvis | fragment | e | Cape Mamont, shore and bar | |
| 76 | MKh-01-165 | Mammuthus primigenius (Blum.) | tusk juv. | fragment | e | Cape Mamont, shore and bar | |
| 77 | MKh-01-166 | Mammuthus primigenius (Blum.) | vert. Thoraic. | fragment | d | MKh shore and bar | |
| 78 | MKh-01-167 | Mammuthus primigenius (Blum.) | vertebr. | fragment | d | MKh shore and bar | |
| 79 | MKh-01-168 | Mammuthus primigenius (Blum.) | femur juv. | fragment | d | MKh shore and bar | |
| 80 | MKh-01-169 | Mammuthus primigenius (Blum.) | humerus juv. | fragment | d | MKh shore and bar | |
| 81 | MKh-01-170 | Mammuthus primigenius (Blum.) | carpal bone | fragment | d | MKh shore and bar | |
| 82 | MKh-01-171 | Mammuthus primigenius (Blum.) | tarsal bone | fragment | d | MKh shore and bar | |
| 83 | MKh-01-172 | Mammuthus primigenius (Blum.) | phalanx | fragment | d | MKh shore and bar | |
| 84 | MKh-01-173 | Mammuthus primigenius (Blum.) | calcaneus | fragment | d | MKh shore and bar | |

Table A8-6 (page 4): List of mammal bones collected on Bykovsky Peninsula in 2001

| Database No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 85 | MKh-01-200 | Equus caballus L. | upper tooth | complete | d | MKh shore and bar | |
| 86 | MKh-01-201 | Equus caballus L. | upper tooth | complete | d | MKh shore and bar | |
| 87 | MKh-01-202 | Equus caballus L. | upper tooth | fragment | d | MKh shore and bar | |
| 88 | MKh-01-203 | Equus caballus L. | upper tooth P2 | fragment | d | MKh shore and bar | |
| 89 | MKh-01-204 | Equus caballus L. | lower tooth | fragment | d | MKh shore and bar | |
| 90 | MKh-01-205 | Equus caballus L. | mandibula | fragment | d | MKh shore and bar | |
| 91 | MKh-01-206 | Equus caballus L. | mandibula | fragment | d | MKh shore and bar | |
| 92 | MKh-01-207 | Equus caballus L. | vert. Cervic. | fragment | d | MKh shore and bar | |
| 93 | MKh-01-208 | Equus caballus L. | humerus | fragment | d | MKh shore and bar | |
| 94 | MKh-01-209 | Equus caballus L. | metacarpal | complete | d | MKh shore and bar | |
| 95 | MKh-01-210 | Equus caballus L. | metacarpal | fragment | d | MKh shore and bar | |
| 96 | MKh-01-211 | Equus caballus L. | metapodial dist. | fragment | d | MKh shore and bar | |
| 97 | MKh-01-212 | Equus caballus L. | tibia | damaged | d | MKh shore and bar | |
| 98 | MKh-01-213 | Equus caballus L. | metatarsal | complete | d | MKh shore and bar | |
| 99 | MKh-01-214 | Equus caballus L. | metatarsal | fragment | d | MKh shore and bar | |
| 100 | MKh-01-215 | Equus caballus L. | tarsal centrale | complete | d | MKh shore and bar | |
| 101 | MKh-01-216 | Equus caballus L. | tarsal centrale | complete | d | MKh shore and bar | |
| 102 | MKh-01-217 | Equus caballus L. | phalanx III | complete | d | MKh shore and bar | |
| 103 | MKh-01-218 | Equus caballus L. | phalanx III | complete | d | MKh shore and bar | |
| 104 | MKh-01-219 | Equus caballus L. | atlas | damaged | d | Cape Mamont, shore and bar | |
| 105 | MKh-01-220 | Equus caballus L. | mandibula | fragment | d | Cape Mamont, shore and bar | |
| 106 | MKh-01-221 | Equus caballus L. | humerus | fragment | d | Cape Mamont, shore and bar | |
| 107 | MKh-01-222 | Equus caballus L. | tibia | damaged | d | Cape Mamont, shore and bar | |
| 108 | MKh-01-223 | Equus caballus L. | tibia | fragment | d | Cape Mamont, shore and bar | |
| 109 | MKh-01-224 | Equus caballus L. | metacarpale juv. | fragment | d | Cape Mamont, shore and bar | |
| 110 | MKh-01-225 | Equus caballus L. | phalanx III | complete | d | Cape Mamont, shore and bar | |
| 111 | MKh-01-226 | Equus caballus L. | astragalus | complete | d | Cape Mamont, shore and bar | |
| 112 | MKh-01-227 | Equus caballus L. | mandibula | fragment | d | MKh shore and bar | |
| 113 | MKh-01-228 | Equus caballus L. | upper premolar | complete | d | MKh shore and bar | |
| 114 | MKh-01-229 | Equus caballus L. | upper tooth | complete | d | MKh shore and bar | |
| 115 | MKh-01-230 | Equus caballus L. | upper tooth | fragment | d | MKh shore and bar | |

Table A8-6 (page 5): List of mammal bones collected on Bykovsky Peninsula in 2001

| Data-base No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 116 | MKh-01-231 | Equus caballus L. | lower tooth | complete | d | MKh shore and bar | |
| 117 | MKh-01-232 | Equus caballus L. | upper tooth | fragment | d | MKh shore and bar | |
| 118 | MKh-01-233 | Equus caballus L. | radius | fragment | d | MKh shore and bar | |
| 119 | MKh-01-234 | Equus caballus L. | calcaneus | damaged | d | MKh shore and bar | |
| 120 | MKh-01-235 | Equus caballus L. | phalanx II | complete | d | MKh shore and bar | |
| 121 | MKh-01-236 | Equus caballus L. | phalanx II | complete | d | MKh shore and bar | |
| 122 | MKh-01-237 | Equus caballus L. | carpal bone | complete | d | MKh shore and bar | |
| 123 | MKh-01-238 | Equus caballus L. | carpal bone | complete | d | MKh shore and bar | |
| 124 | MKh-01-239 | Equus caballus L. | sesamoid | complete | d | MKh shore and bar | |
| 125 | MKh-01-240 | Equus caballus L. | ? | fragment | d | MKh shore and bar | |
| 126 | MKh-01-241 | Equus caballus L. | phalanx I | damaged | d | MKh shore and bar | |
| 127 | MKh-01-300 | Rangifer tarandus (L.) | cranium | fragment | d | MKh shore and bar | |
| 128 | MKh-01-301 | Rangifer tarandus (L.) | antler | fragment | d | MKh shore and bar | |
| 129 | MKh-01-302 | Rangifer tarandus (L.) | antler | fragment | d | MKh shore and bar | |
| 130 | MKh-01-303 | Rangifer tarandus (L.) | antler | fragment | d | MKh shore and bar | |
| 131 | MKh-01-304 | Rangifer tarandus (L.) | vertebrae | fragment | d | MKh shore and bar | |
| 132 | MKh-01-305 | Rangifer tarandus (L.) | vertebrae | fragment | d | MKh shore and bar | |
| 133 | MKh-01-306 | Rangifer tarandus (L.) | scapula | fragment | d | MKh shore and bar | |
| 134 | MKh-01-307 | Rangifer tarandus (L.) | radius | fragment | d | MKh shore and bar | |
| 135 | MKh-01-308 | Rangifer tarandus (L.) | metacarpale juv. | fragment | d | MKh shore and bar | |
| 136 | MKh-01-309 | Rangifer tarandus (L.) | pelvis | fragment | d | MKh shore and bar | |
| 137 | MKh-01-310 | Rangifer tarandus (L.) | antler | fragment | d | Cape Mamont, shore and bar | |
| 138 | MKh-01-311 | Rangifer tarandus (L.) | vert. lumb. | fragment | d | Cape Mamont, shore and bar | |
| 139 | MKh-01-312 | Rangifer tarandus (L.) | vert. lumb. | fragment | d | Cape Mamont, shore and bar | |
| 140 | MKh-01-313 | Rangifer tarandus (L.) | vert. lumb. | fragment | d | Cape Mamont, shore and bar | |
| 141 | MKh-01-314 | Rangifer tarandus (L.) | ? | fragment | d | Cape Mamont, shore and bar | |
| 142 | MKh-01-315 | Rangifer tarandus (L.) | antler | fragment | d | MKh shore and bar | |
| 143 | MKh-01-316 | Rangifer tarandus (L.) | tooth | fragment | d | MKh shore and bar | |
| 144 | MKh-01-317 | Rangifer tarandus (L.) | scapula | fragment | d | MKh shore and bar | |
| 145 | MKh-01-318 | Rangifer tarandus (L.) | astragalus | complete | d | MKh shore and bar | |
| 146 | MKh-01-320 | Alces sp. | antler | fragment | d | MKh shore and bar | |

**Table A8-6 (page 6): List of mammal bones collected on Bykovsky Peninsula in 2001**

| Data-base No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 147 | MKh-01-321 | Rangifer tarandus (L.) | antler | fragment | d | MKh shore and bar | |
| 148 | MKh-01-322 | Rangifer tarandus (L.) | tooth | fragment | d | MKh shore and bar | |
| 149 | MKh-01-323 | Rangifer tarandus (L.) | scapula | fragment | d | MKh shore and bar | |
| 150 | MKh-01-324 | Rangifer tarandus (L.) | metatarsal | fragment | d | MKh shore and bar | |
| 151 | MKh-01-325 | Rangifer tarandus (L.) | astragalus | damaged | d | MKh shore and bar | |
| 152 | MKh-01-326 | Rangifer tarandus (L.) | phalanx III | damaged | d | MKh shore and bar | |
| 153 | MKh-01-379 | Ovibos sp. | scapula | fragment | d | MKh shore and bar | |
| 154 | MKh-01-380 | Ovibos sp. | naviculare | complete | d | MKh shore and bar | |
| 155 | MKh-01-381 | Ovibos sp. | cranium female | fragment | d | Cape Mamont, shore and bar | |
| 156 | MKh-01-382 | Ovibos sp. | metatarsal | fragment | d | MKh shore and bar | |
| 157 | MKh-01-383 | Ovibos sp. | tooth | fragment | d | MKh shore and bar | |
| 158 | MKh-01-384 | Ovibos sp. | carpale II+III | complete | d | MKh shore and bar | |
| 159 | MKh-01-400 | Bison priscus Boj. | tooth lower M3 | complete | d | MKh shore and bar | |
| 160 | MKh-01-401 | Bison priscus Boj. | carpale II+III | complete | d | MKh shore and bar | |
| 161 | MKh-01-420 | Bison priscus Boj. | femur | fragment | d | MKh shore and bar | |
| 162 | MKh-01-421 | Bison priscus Boj. | astragalus | complete | d | MKh shore and bar | |
| 163 | MKh-01-422 | Bison priscus Boj. | phalanx I | complete | d | MKh shore and bar | |
| 164 | MKh-01-423 | Bison priscus Boj. | phalanx I | complete | d | MKh shore and bar | |
| 165 | MKh-01-424 | Bison priscus Boj. | metacarpal | fragment | d | MKh shore and bar | |
| 166 | MKh-01-425 | Bison priscus Boj. | upper tooth premolar | complete | d | MKh shore and bar | |
| 167 | MKh-01-426 | Bison priscus Boj. | upper tooth | complete | d | MKh shore and bar | |
| 168 | MKh-01-427 | Bison priscus Boj. | astragalus | complete | d | MKh shore and bar | |
| 169 | MKh-01-428 | Bison priscus Boj. | naviculare | complete | d | MKh shore and bar | |
| 170 | MKh-01-429 | Bison priscus Boj. | phalanx II | complete | d | MKh shore and bar | |
| 171 | MKh-01-430 | Bison priscus Boj. | phalanx III | fragment | d | MKh shore and bar | |
| 172 | MKh-01-449 | Bison priscus Boj. | atlas | complete | d | Cape Mamont, shore and bar | |
| 173 | MKh-01-450 | Bison priscus Boj. | vert. cervic. | complete | d | Cape Mamont, shore and bar | |
| 174 | MKh-01-451 | Bison priscus Boj. | vert. cervic. | complete | d | Cape Mamont, shore and bar | |
| 175 | MKh-01-452 | Bison priscus Boj. | vert. cervic. | fragment | d | Cape Mamont, shore and bar | |
| 176 | MKh-01-453 | Bison priscus Boj. | vert. thoraic. | complete | d | Cape Mamont, shore and bar | |
| 177 | MKh-01-454 | Bison priscus Boj. | vert. thoraic. | complete | d | Cape Mamont, shore and bar | |

Table A8-6 (page 7): List of mammal bones collected on Bykovsky Peninsula in 2001

| Data-base No. | Field label | Taxon | Skeleton element | Preservation | Loc. type *) | Locality | Elevation (a.s.l.) |
|---|---|---|---|---|---|---|---|
| 178 | MKh-01-455 | Bison priscus Boj. | vert. thoraic. | complete | d | Cape Mamont, shore and bar | |
| 179 | MKh-01-456 | Bison priscus Boj. | vert. lumb. | complete | d | Cape Mamont, shore and bar | |
| 180 | MKh-01-457 | Bison priscus Boj. | vert. lumb. | complete | d | Cape Mamont, shore and bar | |
| 181 | MKh-01-458 | Bison priscus Boj. | vert. lumb. | complete | d | Cape Mamont, shore and bar | |
| 182 | MKh-01-459 | Bison priscus Boj. | horn sheet | damaged | d | Cape Mamont, shore and bar | |
| 183 | MKh-01-460 | Bison priscus Boj. | horn sheet | damaged | d | Cape Mamont, shore and bar | |
| 184 | MKh-01-461 | Bison priscus Boj. | mandibula | fragment | d | Cape Mamont, shore and bar | |
| 185 | MKh-01-462 | Bison priscus Boj. | humerus | fragment | d | Cape Mamont, shore and bar | |
| 186 | MKh-01-463 | Bison priscus Boj. | humerus | fragment | d | Cape Mamont, shore and bar | |
| 187 | MKh-01-464 | Bison priscus Boj. | pelvis | fragment | d | Cape Mamont, shore and bar | |
| 188 | MKh-01-465 | Bison priscus Boj. | tibia | damaged | d | Cape Mamont, shore and bar | |
| 189 | MKh-01-466 | Bison priscus Boj. | tibia | fragment | d | Cape Mamont, shore and bar | |
| 190 | MKh-01-467 | Bison priscus Boj. | metatarsal | complete | d | Cape Mamont, shore and bar | |
| 191 | MKh-01-468 | Bison priscus Boj. | phalanx III | complete | d | Cape Mamont, shore and bar | |

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